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*The Oldest American Aeronautical Magazine*



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*over Hawaii*

Nine years ago Inter-Island Airways inaugurated service in Hawaii. Today, as its graceful Sikorskys ply back and forth among the islands, the hum of the Hornets has become a familiar sound. Throughout the history of Inter-Island, every airplane in its service has been powered by Pratt & Whitney engines.



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## for you who want to *Go Ahead with* AVIATION



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**PARKS Provides College Background with Specialized Training in each of these Four Careers—**

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AVIATION  
September, 1935  
8

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AVIATION  
September, 1935  
9

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VALVE FACE GRINDING MACHINE



SIoux No. 602 Valve Face Grinding Machine WET GRINDER

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## TEN YEAR REPORT

The Kollsman Instrument Company started ten years ago as a one-man laboratory. Today, with a personnel of over three hundred, it is the largest organization in the country exclusively devoted to the manufacture of aircraft instruments.

For years every American airline has used Kollsman Precision Instruments. And, directly or through licensees, this company now supplies the transport airlines and government air services of the principal countries of the world.

This growth has resulted solely from the superiority of Kollsman abilities in research, development, manufacturing. From the beginning, Kollsman instruments have been distinguished by quality, precision, reliability. Recognition of their perfection has led to world-wide use.

*The Kollsman line of Aircraft Instruments is complete, and includes:*

ACCELEROMETERS  
AIR SPEED INDICATORS  
ALTIMETERS  
CLIMB INDICATORS  
COMPASSES  
ELECTRIC TACHOMETERS  
FUEL QUANTITY GAGES  
FUEL PRESSURE GAGES  
ICE WARNING INDICATORS  
MANFOLD PRESSURE GAGES



OIL PRESSURE GAGES  
PITOT-STATIC TUBES  
PRESSURE WARNING UNITS  
SENSITIVE ALTIMETERS  
STATION BAROMETERS  
SECTION GAGES  
TACHOMETERS  
THERMOMETERS  
TURN AND BANK INDICATORS  
VERTICAL SPEED INDICATORS

**KOLLSMAN INSTRUMENT CO., INC.**

5008 FORTY-FIFTH AVENUE

ELMHURST, NEW YORK

WESTERN BRANCH: GRAND CENTRAL AIR TERMINAL, OLENDALE, CALIFORNIA



THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

21

**TABLE 1**

## AMERICA'S PILOTS IN THE KENDALL HALL OF FAME



S. J. WITTMAN, OF OAKGROVE, VA.

During the past ten years, whenever planes were racing, whenever the supreme tests of speed, endurance and flying, open-air, open-air, took place, there Mr. Wittman has been found in one of his favorite places, the Chief of Base. Operator of a flying school, instructor, and pilot, airport manager, international race car, and passenger and cargo plane, he is the Kendall Air Force, Inc., member of speed records and holder of world records. Mr. Wittman is a successful member of various halls of fame. Of Kendall's Hall of Fame, too, for his great achievements. Mr. Wittman depends on Kendall Oil for reliable lubrication.

Why does America's leading pilots use Kendall Oil to lubricate the motors of their planes? It is because they know they can depend upon Kendall to stand up under the most grueling test. Because Kendall's unique performance record proves its splendid lubricating quality. Because they know that Kendall is refined, by special processes, 100% from Bradford, Pennsylvania Crude . . . the cleanest in the world. Because they know that Kendall's individually numbered, refinery-sealed cans bring them this quality oil absolutely pure and uncontaminated. Kendall Oil is available at most airports throughout the country.



## From the Skyways of the World

■ AIR PAUL KELLER is to the growing list of aviators who have served U. S. aviation continuously and well for a decade. Just 33 years ago he looks away from a job he didn't like, retired on shore leave, bought a second-hand biplane, did a few and was on his way to work as the Kellerman Insurance Company—a steady career move.

Today few men are more respected in routine aviation parlance—for "Kellerman's aviation" are given to every airline pilot for every landing. The name has become synonymous with the serious attention found on practically all aircraft maintenance records and in most ground stations.

In the ten years between, Kellerman's insurance company has expanded tremendously. From one room it has passed through several stages to its present 75,000 square foot home in Elmhurst where over 300 people are now at work on aircraft maintenance of many kinds. But Paul Kellerman still finds time to devote to aviation. He is currently President of the National Association of Aircraft Engineers. He is also a member of the National Association of Aircraft Engineers. He is also a member of the National Association of Aircraft Engineers. He is also a member of the National Association of Aircraft Engineers.

■ WHEN PEOPLE FIRST LINE GETTING started, nothing seems so silly to try, judging from the number of people who have been known to take a day's work with them for a surprise in the air. But a new twist was given the story recently when Edward L. von Gien, of Hollywood, asked Captain Richard Dawson to take him up to 10,000 ft. (above the

three mile limit) in a United States Navy over Union Air Terminal, Elmhurst, and there to perform a ceremony which United has (we did not) with the present Mrs. Jean Dawson von Gien (or is she?). It is all very confusing, for the Los Angeles County recorder refused to record the ceremony.

days, and Mrs. von Gien (or Mrs. Weisner) is now among her husband for at least 30 years (Gien) to date, since when her status is. The son is already in law, Mr. and Mrs. von Gien were last reported on a long-term via United Airlines to Chicago.

■ FIVE YEARS OF THE MARCH, To Gary, Pennsylvania, to give a list with 5 J. J. von Gien, and to look over his long history. Many John Kellerman, had numerous and other kinds of aircraft accidents from the A-10 down. At Lockdown for a pleasant afternoon with Mrs. von Gien and the Air Force. They've done an amazing good job in production and materials handling at the new factory and the Gien are taking out the back door at a great rate. Most of the time, it is a hard time or so at Westport but was taken in hand by his assistant, Mr. Dawson, and given a fine tour through Lockdown's (Aviation Mfg. Co.) in good and proper appreciation.



"With a load on Kellerman always takes off!"

AVIATION  
BUREAU, 1937





## WHEELS DOWN... THEN LANDING IMPACT... THEN BRAKING... THEN *Taxi-ing!*

Because the stiffer shocks encountered in landing on airplane tarmac is character and its degree of severity from those encountered through land-  
ing impact, they demand separate resources of shock-absorption. Bendix provides them. Bendix Powerflex Shock Struts soak up the initial blows of first ground contact through hydraulic cushioning; then absorb the lesser bumps of taxiing by manual air. Both functions are calibrated with precision, to achieve best possible results with the individual airplane's weight and normal landing speed. Responsive control of direction and velocity is furnished by Bendix Airplane Brakes. Unquestionably, Bendix is best able to help coordinate these factors with all the other elements of your plane's design when given an early opportunity to work with you.

**BENDIX PRODUCTS DIVISION**  
OF BENDIX AVIATION CORPORATION • SOUTH BEND, INDIANA

# BENDIX

AIRPLANE WHEELS • BRAKES • PILOT SEATS • PNEUMATIC SHOCK STRUTS

AVIATION  
September, 1938

18



DOUGLAS CORRIEN recently added much to the genre of pictures at a time when education of international tourism was really needed, and he provided valuable, whimsical, and rather comical illustrations with a little help for thousands of eyes. Most of the commentators seemed to think that his "wrong way" flight was something unique in the history of aviation, not realizing that Mr. Levine was the originator of that style of flying. You will probably recall that way back in 1927 Mr. Levine planned a return



flight from Paris to New York but flew toward India, mistaking it for Oughit. "The weather was better in that direction."

CORRIEN's picture was noted in one way, however. Max Isidore-making flight was followed by a large number of advertisements for the manufacturers of accessories which contributed toward its success, but so far no manufacturer has proclaimed that

it was his company which "made in the wrong direction" and just before Corriens landed in India.

DOUGLAS THE QUALITY WILL SHOW. Mr. Corriens a good position somewhere in the field of aviation, and we certainly hope it does. Our only comment would be that his peculiar system does not fit him for the job at point of either plane to the Mayo "Wind-a-back" arrangement—on taking what would happen if those station airplanes started his different destinations right in the middle of the take-off run.

IN ONE of his earliest speeches following his record landing flight around the world Howard Hughes predicted that trans-oceanic planes will soon be in the air as large as present-day ocean liners. When the time comes to build the flying ocean liner we'll be expecting it to be designed on the drafting board of Whaling Waterman. Having rebuilt a Standard into a "flying locomotive" for the 1928 Air Race and having brought out his "flying automobile" recently, the construction of an ocean liner seems the next logical step for him.

AN ASSOCIATED PRESS DISPATCH describing the use of target planes for new-builders' practice states:

"British gunners for two or three years have been firing at a full-size radio-controlled plane, the Queen Bee, operated by the Royal Air Force. Thousands of it had been brought down a number of times, patched up, and used over again."

Unofficial reports have it that one time after the target plane had been brought down the R. A. F. officials were surprised to find Bob Burns' Granda Seaway in a flying shape.

WE see in THE HARRY that the government publication "Landing Care" now includes some hints on the care of the baby while traveling by air. This booklet has been the government's best seller since 1914, when it was published the previous best seller, "The Care of the Horse." This latter publication could be made popular again, at least among airplane-



people, if the title were changed to "The Care of the Horse" and a few chapters added on newfangled, super-chargers, magnets, and fuel and all systems.

AN ATTENDANT MANUFACTURER recently found a farmer using the engine of one of his earliest models to operate a water pump, the units were serving as pump handles and the wheels were on a boy tractor. He proudly admitted that you could throw one of his cars but you couldn't kill it.

With such increasing losses in the airplane business the old airplane problem becomes acute serious and we are glad to note that many new ones have been discovered for retired models. Some of the old airplanes are serving as hot dog stands and filing stations which is a modified but at least useful. One old model has been mounted on top of a three-foot steel tower in the middle of an Ohio orchard, where it is used to keep a better lookout over the tree tops to prevent looting from fruit.

First of course, there is that other power who found a work use for an old plane when he flew it from New York to India.

AVIATION  
September 1938

19



## \* AVIATION for September, 1938 \* \* \* \* \*

### "AVIATION ON PARADE"

Congress Labor Day week-end, and the National Air Races, events that have become gradually synonymous in aviation circles. What with a shorter, swifter program, a broad new set of rules, and a total prize well over \$100,000, the annual race meet at Cleveland has attracted the largest and most promising lot of starters in the three major events for many a year. According to the dope sheet of our trusty Agent 1213-X (Page 21) both the luxury and the back-yard-built jobs should put up performances that will bear watching.

And, although we are a bit weary of doing so, we can't let this aviation page without dragging out and dusting off our usual plea for less of the circus atmosphere and more real aviation promotion at the meet. Jostling, spine-chilling loud-speaker build-ups liberally mixed with too, too obvious "romanticism", and the spectacle of death-defying automobile stunts critically limit nothing in the real purpose of the occasion nor contribute one iota to the advancement of aviation. If the real purpose of the race sponsors is to provide a yearly glimpse of "Aviation on Parade" there should be better ways of doing so than by a repetition of the old "big-brother" technique. Nobody knows that something different won't work, for it's never been tried.

Here's looking at you, CAA!

### DUAL OR DUEL?

To Washington again, believe, principally to meet the members of the CAA and to see how soon they may be expected to get their teeth into some of this country's pressing problems now that they have been sworn in and are ready to take-over. We found things much as we expected. Individually members of the Authority are men of high calibre filled with a desire to be of Public Service, all sincerely—almost pathetically—eager to find out for themselves what this aviation business is all about. Clearly, all of them have been even more than a little impressed, if not a bit appalled, by the magnitude of the job which they have accepted. To a man, however, they express a grim determination to do right by our Web.

All of which is encouraging, but doesn't change in the least the opinion we expressed last month that we are being another victim in aviation progress. How long it will last will depend on the capacity of the Authority to sleuth and to digest the great mass of

information, misinformation, special pleas, requests for jobs, etc., etc. that is already being dumped up to it. With so little fast-track knowledge in the Authority itself much will depend upon the character of the people to whom the secondary task for secondary counsel and advice. And in spite of our desire to see things moving forward again, we hope that the CAA will move slowly enough to find the right answers, and not get things away on the wrong foot.

But the most critical spot as we see it now lies within the organization of the Authority itself. The law as written is not any too kind on the relationship between the Administrator and the Chairman of the Authority. The latter, ostensibly, was to vest the active executive functions in the Administrator, who becomes, in effect, a super Director of Air Commerce. His job is to compare new projects and to carry them through within the limits set by the law. The five-man board, on the other hand, occupies a quasi-judicial position, to hear appeals on rules and routes and other matters from members of the aviation industry, and generally to pass upon the legality of the acts performed by the administrator. All of which is fine, as long as it works that way, but Washington gossip already hints at conflicting ideas on the subject between Chairman and Administrator. If Mr. Noble intends to use his new job as a springboard to bigger and better things it is Joe Kennedy (and we can't believe entirely that he will seek out of show love for aviation) he must inevitably compete with the Administrator for the limelight. We are sure, however, that both Mr. Noble and Mr. Eaker are big enough men to recognize the unfortunate possibilities of the situation and to subordinate their personal ambitions and their political obligations to the common cause. Above all, we need dual, not dual control.

Formerly aviation is now in a strategically good position out of its own making. In setting up the CAA the Administration had its eye on a much larger issue, the problem of reorganization of the government. The CAA is a test case, a sort of prima pig to try out a new idea in commission organization. If it fails to function according to expectations, the whole program of the reorganization boys may do a period in the next session of Congress. That is something that the White House could ill afford to risk, so it goes without saying that every possible effort will be exerted to maintain harmony and close cooperation within the CAA during these most critical months. That, at least, is the hope for us.

# NATIONAL 1938

Program 

## RACING EVENTS

Saturday Sept. 3

**KEWEE** Field at intervals from noon to 4 P.M.

Plan to start the **Bowling** Conference at Los Angeles at frequent intervals, attempting to build a close field at Cleveland.

**Bowling** Conference planning to complete even leg in Seattle, W. I., expected to land and to remain 21 months in Cleveland before proceeding.

**CONSOLIDATION RACE** for planes falling in quality in preliminary tests for the Thompson and Payne Trophy Series—16 entries—1 laps over 18-mile course, total prize \$1250.

Sunday Sept. 4

**GRIVE** Trophy Race—200 miles—12 laps over 18-mile course, total prize \$11-100.

Laboe Day, Sept. 5

**DISCOVERY** Trophy Race—200 miles—10 laps over 18-mile course, total prize \$10-100.

## Army, Navy and Marine Corps

The Army will be represented by Hughes Army Corps Squadron from Baltimore, Md., and a specialty team, plus possible ground force at least flying and combat equipment.

Navy will have 10 **Grumman** Fighters from U.S. Navy.

Marine Corps—10 **Grumman** Fighters from Quantico, Va.

## Aerobatic Exhibitions

Aerobatic exhibitions will be given every day by Coast Air Squadron, Marine Corps, Army, Navy, and Marine Corps. In a new exhibit including aerobics, **Henry** Bickel, 19 year old German and aerobics exhibition in military glider.

**Earl** Grant, German, in a **Proctor** (both biplane and to have the characteristics of an aerobics, including vertical take-off and landing).

**Miss** Murphy and **Dick** Greene in a dual specialty act and later in air exhibitions.

All forms in aerobics studies. Also, other comedy and specialty exhibitions.

## Parachute Jumping

Daily parachute practice includes five, six or more delayed race in the ground from an altitude of 15,000 feet. Sport jumping: some jumping during the program with a minimum of 10 and possibly 40 participants, several specialty acts.

Also included in each day practice will be "Aerobics and Parachute" with full participation of industry and transport lines.

# AIR RACES

Revised rules and \$100,000 "kitty" are being put together as great a collection of speed planes and race pilots as ever faced a starting flag.

By Charles F. (1313-X) McReynolds

West Coast Editor, AVIATION

ON THE whole, the race is at hand when a flock of eccentric young men take up with clipped wing thunder birds and leave the daylight out of themselves and extrude the world with their antics. Somewhere in this vast and unexplored country somewhere are badly performing well equipped tanks in research laboratories and factories. Langley field is spending millions of dollars of government money on fundamental research. Engineers commission hundreds of engineers on a single design to meet the specifications of an airplane, an engine, or a wing. But Henry Howard once remarked that the reason he built racing planes was because it was the only way he knew to build experimental planes and then get them to pay for themselves. So, far better or far worse, some of the money paid in at Cleveland's own severe turbulence is passed along to a growing group of young fellows who are racing and then immediately spend their prize money in an effort to build better race planes in his same case, etc., etc.

But that we can reject many revolutionary changes in spring from such activity. There is the structural and aerodynamic engineering of race craft always on a par with good contemporary commercial and military practice that the way race builders have handled specialized problems dealing with handling, great maneuver and out of turn, acceleration, engine cooling, oil cooling, cooling ventilation, others an education in ingenuity. That airplane element Henry Howard calls "go faster" is always liberally applied all round.

Visual Results and Frank Miller—(1313)



Incumbent  
C.R. Henderson



Steve Towner



Earl Grant



R. E. Wilson

Josephine Conference  
and Major de Senesch



This year designers have concentrated their efforts on reliability even more than on increased speed for the planes that will fly the four major distances in both the Greve and Thompson Trophy races. By concentrating on improved reliability, both of cylinders and lubricating oil, it is believed that engine strain will be materially lessened. And engine strain has been given to edge of attention and sacrificed by practically all designers in order that pilots may fly the longer distances without undue fatigue.

This year we have a risk-prohibiting Thompson Trophy race from competing in the Bendix transcontinental race. As a result the Bendix this year will be confined almost exclusively to military or commercial types. At this writing we would add the

Bendix a two plane race, though a dozen or more planes are listed as possible entrants. Among possible entrants are two Seversky, one Beechcraft, a Lockheed 14, a Sparta Racoma, a Lockheed Orion, and the Oer Bo J.G.E.D. Frank Fuller should repeat his 1937 victory. Among the most-likely Seversky with which he has set an impressive number of records for point to point flying. But Jacqueline Cochran, probably the only woman entrant, will also pilot a Seversky. We cannot say if not for blood, and then, it won't be improved to use her against a mid-westerner and take home a victory in new record time. Late advice indicates that Pauline Brewster McElhenny will try for the Bendix in the biplane that Jacqueline Cochran once sought to

fly the MacRobertson race, and later used by Howard Hughes to set a transcontinental record. He should race a "biplane" if he starts. We can only guess the prospects of the other entrants or prospective entrants, by listing those in the order in which we would expect them to finish. Al Larry, flying Jack Wright's Lockheed No. 10; Paul Mantz at the controls of a Lockheed Orion; George Armstrong at the O.E.D.; Ted Patrick with his Caudron powered Bendix; Ross Hedley, also with a Beechcraft; Russell Shaw, pushing Vanderbilt's Lockheed 14; John Thomas flying a Weig (a powered Sparta Racoma); and Frank Hawks in an un-motated entry. It may seem as if we put the veteran speed merchant Hawks last on the list, but we have no information on his

ship, and wonder with Al Larry, Ross Hedley, and Russell Shaw, he is a *biplane* entrant. Other rumored entrants include Brewster Tanager in an un-motated plane, Jacqueline Cochran's plane, and a couple of other planes which are still some way off when compared with some of the newer European military equipment. However, we are confident that the four major planes of 1937 are in consideration in our estimation of twenty possible for the qualifying trials. In a month that a couple of these planes may fly the trial of action, leaving only spectators. Some fifteen of these airplanes can start the Thompson, but only one or two of these planes will fly the transcontinental race on the opening day. But the race rules specifically state that "We can't be sure what the four starters will be, we expect to see some sort of a sub-

stantly for the better hope. If the engine came back or if the Germans saw one of the four starters, the Thompson race would be in trouble. As the best of our four starters are still some way off when compared with some of the newer European military equipment. However, we are confident that the four major planes of 1937 are in consideration in our estimation of twenty possible for the qualifying trials. In a month that a couple of these planes may fly the trial of action, leaving only spectators. Some fifteen of these airplanes can start the Thompson, but only one or two of these planes will fly the transcontinental race on the opening day. But the race rules specifically state that "We can't be sure what the four starters will be, we expect to see some sort of a sub-

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## AVIATION'S 1938

"You pay your money and you take your choice." (These tables are

## RACING FORM

based on best available information of the time of going to press)

### RACE PLANES

Best information available at time of going to press

For complete discussion of other possible entrants see text above

No.	Name	License	Cockpit	Pilot	Engine	Weight
1	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
2	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
3	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
4	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
5	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
6	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
7	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
8	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
9	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
10	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
11	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
12	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
13	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
14	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
15	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
16	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
17	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
18	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
19	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown
20	Seversky	1938	Yale	Bob Brown	Lockheed 14	H. A. Brown

RACE  
**1 BENDIX TROPHY**  
Los Angeles-Cleveland-New York  
Total purse **\$30,000**

RACE  
**2 GREVE TROPHY**  
200 miles, 20 days  
Total purse **\$25,000**

RACE  
**3 THOMPSON TROPHY**  
300 miles, 30 days  
Total purse **\$45,000**

NO.	PLANE	PILOT	SPEED	REMARKS
1.	Seversky	Frank Felter	208 mph	The old machine—should repeat. Out to win—may spring again.
2.	Seversky	Jacqueline Cochran	208 mph	Out to win—may spring again.
3.	Seversky	Robert McElhenny	208 mph	Out to win—may spring again.
4.	Seversky	Al Larry	208 mph	Out to win—may spring again.
5.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
6.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
7.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
8.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
9.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
10.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
11.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
12.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
13.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
14.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
15.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
16.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
17.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
18.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
19.	Seversky	Frank Felter	208 mph	Out to win—may spring again.
20.	Seversky	Frank Felter	208 mph	Out to win—may spring again.

own is a veteran pilot who should get every ounce of speed out of his plane that the builder puts in. The first Polaris race, in the R35 on its debut, was an outstanding success in Los Angeles in 1936, its first race out. Then Polaris built the Speed King for Rudy Kling, and flew 314 mi. in seven trials the above last year, winning both the Greve and Thompson Trophy races. With such a background

ground we can't see ourselves betting any other way than for a continuation of the string of Polaris victories. The second Polaris is reported as a counterpart of the very refined design, and is powered with a Westcott C554 engine of 544 in. displacement. A high mid-wing cantilever monoplane with retractable landing gear, the Jacobson Polaris racer is reported to have a shaft more wing area than the Speed King, probably in order to provide for the increased fuel load to fly the Thompson distance.

Although the Schoenfeldt-Rider Prowlerer could do no better than third in the Greve last year, we rate this plane as better than second first year and consider it a very probable first place winner. This year the Prowlerer will be flown by Tony LeVier, a competitive newcomer who proved himself at the Oakland race this May when he flew 150 miles around in 54 net course at an average speed of 120.743 m.p.h., which is almost 4 m.p.h. below Rudy Kling's winning time in the 1937 Thompson Trophy Win. Schoenfeldt and Tony

have completely revamped the Prowlerer and have conducted a careful series of flight tests. Having trouble, the plane looks like a crash to fly the Greve distance at a speed of around

200 m.p.h. The Prowlerer was originally built by Keith Sider in 1935. It is a low wing cantilever monoplane with retractable landing gear. As a sample of the shortcomings with which



Melvin Hoffman of Los Angeles, pilot and owner of the revamped racer "Miss Los Angeles".

Schoenfeldt has prepared it is found in the fact that he has had a total of five propellers built and tested on the plane. To insure adequate cooling for the longer distances the plane is equipped with two oil coolers, one of slide type and the other a conventional cartridge type cooler. A by-pass protects the skin radiator from harmful pressure. Additional fuel capacity has been built in to provide ample supply for the Thompson Trophy distance. Schoenfeldt has also done a major job of revamping the Moonsau engine but the changes made are confidential at this writing. Right alongside the Schoenfeldt Prowlerer at the finish line, and maybe in front of it and everybody



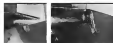
A budgeted racer, Russell Chandler's Chamberlain. New landing gear, retracting vertically into wings in the hushbox. Above: Remondino last spring landing gear on Chamberlain's racer. The final trials were to close the wheel with gear in.



Delco Flash designed by Ryan Associates and built by Ryan's Training School, New Orleans.



Greedy all-metal racer waiting to fly her first flight.



Hydraulically retractable tail wheel of the Greedy racer (a) with tail finning cone retracted and (b) in extended position. (d) tail wheel extended to support the fuselage tail cone.

Greedy's retractable landing gear without retractable, tail finning cone may be retracted while servicing plane.



Remondino landing gear on Art Chamberlain's "Greve".



Tony LeVier in the Schoenfeldt Prowlerer.



Arthur C. Chamberlain in his plane, 1937 the second race into Greve.



Bruce Don Ross takes off for the first flight of the R-35.

Keith Sider with the R-35, built for the Buena Vista Raceway of Glendale, Calif.

Top gear on the Greve showing protrusion up wing of trailing edge of wing at landing.





Maroon-Bronco, showing new feature installed in landing gear which retracts. Bronco's steel plate chassis is much better in protecting engine and other vital parts than all-steel chassis. The all-steel chassis is much better in protecting engine and other vital parts than all-steel chassis.



Steel under hull of Maroon-Bronco shows the landing gear and other vital parts.



View of the Maroon-Bronco engine driven by Ford Overhead Valve and 100 hp. engine, which is much better than other engines.

also, will be Keith Rider's newest work, the B-Ball. This plane was built by the Stutz-Garvey Company and is being raced by the Union Airplane Company of Glendale, Calif. No pilot has been named as yet, though Edgar Dow Rice has conducted the flight tests. The story is out that Rice will lose his flying job with TWA if he wins this year. Rice won't say yes or no, but he won't say no, but we guess he'll be at the controls come September 4th. This little plane is the greatest Rider has built, and we don't know of a better ship under any other trademark. The B-Ball's top speed point job is so slick that forty-eight thousand feet almost are known to have broken there under going to "let down" on it. It is significant to note that of the seven racing airplanes Rider has built, five will be at Cleveland. The first plane crashed at Chicago in 1930 with Major Macaulay, and the other racing member of the Rider family would say it is a hell against the same pilot, says Rider King at Los Angeles in 1936. All the Rider races are of characteristic design arrangement, being sharply tapered low wing, consistent with considerable landing gear. All have Maroon engines except the Two-Wing J. powered Maroon race, which was originally built by Rider. But the structural design of the Rider ship has run the gamut of accepted practice. His first job was all wood, he used steel and finally all metal monocoque fuselage with two-spacer wood wing, his fifth and sixth were steel tube fuselage jobs with monocoque wood wings and his new ship returns

to the all wood structure with a monocoque fuselage, and a sharply tapered and swept back consistent monocoque monoplane wing. The Rider B-Ball has a span of 20 ft. 5 in., length of 19 ft., and tail wing area of 79 sq. ft. Powered with a Maroon C554 engine, the gross weight is 1800 lbs. loaded. As with all the other races, it is fitted with rigid landing edge flaps. Hydraulic brakes and hydraulic shock struts are fitted. The B-Ball was test flown last May and has since been down a number of times. Built by the Stutz-Garvey Co., leading propeller builders at the Pacific Coast, this plane seems loaded from every angle. We wouldn't be surprised to see it dip the pylons for average speeds as high as 200 m.p.h. and don't see how anyone is going to stay in front of it without leaving clouds behind on the flume.



Recent Stutz-Garvey Two-Wing J.

to be a look about the new Group and the winners through which Act Chester has gone in creating his—only once permitted. With Art's well proved ability as a designer, builder, mechanic and pilot we can well expect the Goon to be an immensely



J. J. Williams with his Curtiss C-11 powered Thompson Trophy race plane.

successful plane. By all standards of measurement the Group air production has been just that and we hope the Goon to carry on the tradition. Art has reversed the decision of action of his Maroon C554 engine in order to mount a French two pitch propeller. Water propeller similar to the one used by Thompson in 1936. By mounting his engine backward Art hopes to get further forward. His work in obtaining the French propeller has been hard working as he was approached by the entire French Air Ministry. Permission was finally obtained, however, and the propeller is at the time, supposed to be in the country in the hands of American

Railway Express. Upon delivery of the prop Art will proceed with his last flight and we expect to see the Goon in race shape at Cleveland. The incorporation of a lot of novel and excellent features. Of course the two pitch propeller, with pitch shifting automatically from low to high at 130 m.p.h. air speed, is the major feature of the plane. This should get the Goon off the ground ahead of all competitors, and may serve to keep her ahead once in the air. Art is using a unique wing, with symmetrical airfoil section tapering to the down from 10 per cent chord depth at the root to 5 per cent at the tip. The wing spans from 40 to 45 ft. in

plan form. Of two open wheel construction, all plywood covered, the section has been tapered at the root and tip so as to give a semi-angle of incidence at those points while the maximum incidence of 24 degrees is reached at a point 20 in. outboard from the tailplane. The engine is a true midwing. Landing gear is fully retractable into the fuselage, hydraulically, and the tail also has retract. The reserve complete is as close as a whistle and special attention has been given to the engine cooling, both in its design and efficient cooling. With a span of 38 ft. 6 in. and a length of 21 ft. 4 in., the Goon has a wing area of 66 sq. ft. efficient, and a gross weight of 1800 lbs.

The J. J. Williams' Special, which so far has brought its owner and pilot Dave nothing but a headache, is slated to do a semi-circle from the crash landing. No pilot at Glendale which might have selected it to the jump home. A later design the Elmer's Special is now the property of Hal Maroon, who will use her as the Jackrabbits Special. Maroon's trunk headmistress, Jack Fremberg and J. J. Williams, have supervised a complete rebuild job on the Jackrabbits Special and it should show at Cleveland the same smooth running rebuilding that has characterized the big Maroon-Bronco race car the past two years. The work that has been done on the Jackrabbits has been aimed at reliability rather than speed as we shall expect to see this plane right in there flying after some of the others in the race have retired. We don't see how the Jackrabbits can get in front of the Special. (First in June 27)



C. R. Fournier and Lee Williams, of the Two-Wing J, powered by Maroon C554 engine.

L. J. Williams, who won the Thompson Trophy race, with his Two-Wing J, powered by Maroon C554 engine.



View of the Two-Wing J.





### 3 SPOTS and a HORN

**By Donald G. Fink**  
*Public Editor*

A preliminary account of the EAC-MIT Blind Landing System based on Irvin Matcalf's "three-light" method.

[illegible]

terly economic change in the apparent vertical position of the glide path. That these problems are not more resolvable has been proved by the intensive development of the system by such organizations as Washington Institute of Technology, Losmo A. Q. of Berlin, and United Airlines-Bendix. It cannot be denied, however, that these difficulties have been the principal bar to acceptance of blind land-  
ing as a commercial thing.

Some two years ago there was projected into the picture a brand-new idea, conceived in the spirit of fervent idealism, and the spirit of Air Corps major, the "three leg" system. The idea, the "three leg" system was, as it was then, that there was an opportunity for doing things that the Army could not do, and an organization capable of developing it in practice form. He found the organization in the Department of Railroad Engineering, M.I.T., in the Office of the Director of the Federal Railroad Administration, Division of the Federal Railroad Board, under whose jurisdiction the project had been carried forward. The Communications Division has been noted for a very long time as being an organization having spent much time with legislation, and similar projects of importance to aviation. President Charles S. Draper of the Aeronautics Department of M.I.T. has been one of the most active participants in the project of the project.

The Merrill ideas looked good to MIT. Likewise they looked good to the Bureau of Art Commission, who underwrote a contract for a 12-month program to be carried out in the MIT laboratories at Cambridge. At the end of that period, in June 1958, the work had progressed to the point where an extension of an additional 15 months was found justified by the Bureau, and the wheel-and-axle account.

At the present writing, the World-Milit system of hand-landing has not yet been flown in an airplane. If it is, in other words, still very much in the experimental stage. But it shows such promise that many interested parties, including the Army, are at two of the major airlines, and several important companies in the aircraft-instrument and communications-equipment fields, have beaten a path to Cambridge to watch the new "mouse trap" catch mice on an experimental basis.

Recently your radio editor went to Cambridge to gain at first hand some idea of the principles involved in the new system. In the course of a full night-long day, he was kept busy digesting the answers to all the questions he could think of.

### The Meicot Three-Light System

The original idea harks back to the theorem in plane geometry which states that three circles determine a



place. The plane in this case is a "landing reference plane" inclined to the surface of the airport, as shown in the accompanying diagram. Mikhalev reasoned that if these delicate points in this plane could be in some way made visible to the pilot, then, in any circumstances, regardless of actual visibility conditions, the pilot could perform a landing in relation to these three points alone. The idea may be visualized by envisaging three outermost points of the runway, which are on the surface of the airport, the other two suspended no farther side of the runway, and visible to the pilot under any conditions. It requires very little mental coordination to visualize the plane passing through these three points, to imagine the plane's path, to imagine the angles, and to visualize the landing path of the ship as a line connecting in this plane. With the help of this visualization, the pilot can land at the three points as visible regardless of the weather. This means no change of the airport surface.

At first glance the idea appears attractive, but highly impractical. To verify this, a questionnaire was sent to 15 light engineers, an experimenter with long experience, and the literature was reviewed. The literature revealed that if three transmitters, with single tones or some other type of directional beam, were set up on the airport, and if the direction from the airplane to each of these transmitters could be determined by directional receivers, then the apparent position of the transmitters might be suitable to the pilot; simultaneously, one receiver mounted on the instrument panel, highly accurate direction finding, would be the first requirement, and some means of transferring the indicated direction into "apparent positions" would be the second.

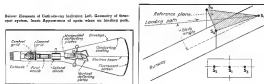
One of the possibilities of approach to the problem of accurate direction finding involves signals which fall out of the radio classification category i.e., infra-red rays. Infra-red has been a magic word for many years; the phoneticist will have none of it because "posturing" is infra-red. A heavy fog can be calculated quite easily, and the calculations lead to the conclusion that this observation is in

would not have the limitations imposed by nervous workers.

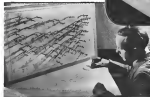
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Conversely, a beam having a high germinative index seldom will produce a broad first beam, and two such beams can be used to create overlapping beams suitable for establishing a diversity in the vertical, but not horizontal, plane. By these means beams may be projected into space independent of the ground, since the projection depends only on reflections from the beam surfaces, and upon diffraction effects at the beam edges. Consequently, the beams are extremely suited with respect to changes in ground conditions. Further, when two beams are made to overlap one another, the region of overlap is straight. Consequently, when such a region of overlap

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# SEEING



R. C. Stevens, head of the meteorology department, has developed these visual aids for air-traffic control training.

**A**TENTION IS NOT AN EASY SUBJECT, at any of its branches. Much of our design work must still be based on empirical formulas. We know as little of such a fundamentally important thing as air flow that we need devote thousands of hours to testing models, and even full size planes, with the aid of complex recording instruments, smoke streams, etc. Because of this general condition it has been difficult to perfect a satisfactory classroom technique in teaching aviation theory.

Many students enter aviation training with mental "in the clouds" due to the stresses and "vibrance" of aviation. For such students it is doubly important that we find ways of bringing the aviation "facts of life" squarely before them. This need to clarify the presentation of aviation knowledge has led us to develop at the Boeing School of Aeronautics, a program of visual education that plays a big part in all of our teaching activities. So satisfying has this teaching aid proved that we have carried it to a high state of perfection, probably further than any educational



## is Believing

Visual instruction methods at the Boeing School of Aeronautics

By Allan F. Bonnalle,  
*Director of Technical Instruction*

instruction of any kind has developed similar methods. And we are convinced that the visual way of teaching, based on our experience with it, is due to much wider development. To explain in a paragraph the time-honored method of visual instruction as we have applied it we may disagree by our approach to teaching meteorology. The accepted way of teaching meteorology has been to supply the

student with a good text-book, merely well illustrated with pictures of clouds. After he had read his book, at part of it, and looked at cloud pictures, the instructor took the class on field trips to look for actual clouds, and to compare their relation to various atmospheric phenomena that at about that point the instructor noted. For a really comprehensive knowledge of cloud phenomena and their significance



Looking at text from the KASL, Boeing School students study air flow phenomena by projecting text section of a smoke tunnel in a lecture room.



This lecture of clouds in smoke stream on his shaded area easily is the equivalent and the directly one spread out for lecture.



Approximate for studying clouds of smoke and rain phenomena.



Demonstration of the spray mechanism used in simulated clouds.



Where birds go and why is explained by Instructor Davis.

It was necessary for the student to visit the passage of sufficient time for him to personally observe various conditions of clouds in action.

In our meteorology classes under the guidance of E. C. Haguen, we supplement book work and personal observation of local weather conditions

with showing of moving pictures illustrating widely varying weather conditions along the entire transcontinental stretch between San Francisco and New York. Then we add to the illustration demonstrations with three-dimensional models of "weather fronts," cloud layers, the Sferens cyclone model, etc. These cloud and air current models show the students the actual depth of air layers, their respective temperatures, directions and velocities, and the resulting phenomena. They are able to see clouds from above as well as from below, and not only to see them but actually handle them. This custom of "visual" education is the point where the students actually learn and feel the three-dimensional model that is being used is visualized they learn for them is one phase of teaching which is proving invaluable.

Another aid to meteorological instruction is a "dynamic" model we have developed to illustrate what happens when air masses of varying temperatures and densities mix. For this purpose we use a glass plate very closely in which a thin layer of oil is poured. The oil layer is divided into two compartments and we are ready to start a "storm" for the class. By using blue or red ink in water the different bodies of water, we see also is what happens when the den is removed. To illustrate varying air mass densities we use salt water in to produce the desired condition. Then when the salt is removed the salt water will sink to the bottom and cause a "cold front" in air, as it was indicated. The water level we use due to the different colors of the two bodies of water. The effect produced is highly educational. Also, by using a hot spot under a prism of the water channel we can produce rays of light of warm water to simulate the rising currents of heated air which produce cumulus clouds in the atmosphere.

This method of visualizing lessons for the students not only speeds the educational process, but actually explains certain things that could never be taught properly in any other way. This is particularly true of such problems as teaching complex mechanical linkages, a subject to which we have come to do justice. But by means of models, diagrams made by the students themselves, and always closely bonded by classes receiving such instruction, every phase of such movement is clearly illustrated to the mind of the student. Thus we prepare on the old Chinese proverb to the effect

(To be continued)







# AIRCRAFT ARMAMENT

In his first article the author described modern aircraft armament. He winds up the discussion with a detailed study of the gun installations in a typical multi-gun fighter

NO MATTER HOW EFFECTIVE an airplane is armed, the effective use of the armament depends on a large measure upon its installation. This is especially true of the gun mountings. The problem of mounting guns in airplanes presents many difficulties for, besides the mechanical problems of gun force coupling, operation and balance there is also the aerodynamic problem of preventing gun barrels from exerting too much resistance, flight path, wind vibrations and propeller vibration due to differences when firing bursts.

The large, high-powered combat plane does not suffer in many respects as the single plane or dual plane plane when large guns are used.

In the combat plane, the gun can be placed about the ship in such a way that a sufficient concentration of fire (3 to 6 guns) can be directed at one spot and there is ample room for operating the guns by mechanical means. (A suggested arrangement for maximum protection is described below.) The most formidable position for gun placement is in the nose and tail where a clear field of fire, and a large view for the gunner can be obtained. These positions are difficult for both effective and defensive tactics. A nose turret (A) provides the best position for attacking opposing airplanes from the rear and side and affords protection against attack from front. The tail

position (B) is essential for laying a course of fire to the rear for both offense and defense. A machine similar to the Type F previously described (Aviation, July 1936, p. 21) when placed in a tail turret can be made to cover fully three-quarters of the front hemisphere. The spherical turret mounted to turn freely about a vertical axis, horizontal axis is capable of such operation. In the turret shown in (A) the gun is rigidly mounted in the hull as in the gunner's nose and right. The turret is rotated by mechanical means and counteracted by a clock, operated by the gunner. The gun is fired by means of a pistol grip on the control stick or a foot pedal. No manual

handling of the gun can be envisaged since the main forces on the turret at speeds of 250 m.p.h. or over produce efficient operation by hand. With mechanical means in his disposal, and with his seat and sight fixed relative to the gun, the gunner can follow his target around. He can sight his gun on an objective and lay down an effective barrage of explosive shells by "fling" his turret on the path of the enemy airplane. Then, although he is a "flying" turret, the turret in a pursuit plane faces a single plane airplane as the target, the usual plane is flying and maneuvering independently or in a formation. In fact, he has all the maneuverability of a small gunner and at the same time a steady firing platform. Furthermore, while the need of a heavy cannon may be a serious handicap in the small plane, in a plane of this size and power it is not of serious consequence. Assuming the plane to have 2000 h.p. for level flight the gun will have a slight negative horsepower and exerts a small pull of 1700 in performing a slight descent.

For speed of 250 to 350 m.p.h., the heavy cannon (30 or 35 mm.) should not be difficult since the neighboring tail surfaces tend to screen this position.

(B) shows a fighting deck gun above and to the rear of the wing consisting of a spherical turret in which is mounted a gun similar to the type M or Machine 27 mm. In the turret also, the gun, gunner's seat and sight are fixed to the turret

## Part II By Horace J. Aller

tion. Calculations have shown that the drag of large guns has very little effect on the control and maneuverability of the plane.

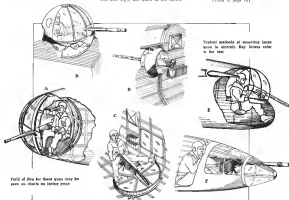
The bottom end of the airplane has always been the "Achilles' Heel" and is subject to the most devastating fire. The rear gun is necessary for a defensive as well as offensive position. The dimensions of the tail portion of the airplane does not permit the use of a large gun and the most severe heavy cannon. A 30 or 35 mm. machine gun seems to be the optimum machinegun. Manual control should not be difficult since the neighboring tail surfaces tend to screen this position.

(C) shows a fighting deck gun above and to the rear of the wing consisting of a spherical turret in which is mounted a gun similar to the type M or Machine 27 mm. In the turret also, the gun, gunner's seat and sight are fixed to the turret

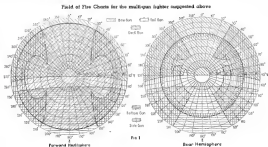
which can be rotated on a turret similar to the nose turret. Just forward of this turret is a fire control and bombing operations station. The top and rear gun turrets cover the entire hemisphere above horizontal.

The side guns, mounted fore and aft are small caliber machine guns which give adequate distance fire and great concentration of fire to the side for close ranges. It can be seen that a "breadth" from a ship of this type consisting of a 35 mm. cannon (with explosive shell) two side guns of 30 or 35 mm. and an upper gun of 20 mm. (with explosive shell) will be a weapons of fire that will bludgeon the opposing airplane out of the sky.

For speeds of 250 to 350 m.p.h., the heavy cannon (30 or 35 mm.) should not be difficult since the neighboring tail surfaces tend to screen this position. (B) shows a fighting deck gun above and to the rear of the wing consisting of a spherical turret in which is mounted a gun similar to the type M or Machine 27 mm. In the turret also, the gun, gunner's seat and sight are fixed to the turret



Field of fire for these guns may be seen on charts on facing page





## THE FIRST 100 HOURS Are the Hardest!

**I**N EARLY AUGUST, after two months of flight testing, the Douglas DC-4, used earlier, right, under factory flight testing to complete the rigorous program outlined by Douglas engineers. More than forty flights were made during the first two months, averaging almost an hour each. Upon completion of the factory test program the ship will be turned over to the airlines for a period of seven-to-eighteen over various routes under operating conditions.

Content of the flight test program, efficiency, correlation and acceptance

not of data gathered, has been in the hands of Arthur E. Raymond, vice-president and chief engineer of the Douglas Aircraft Company. In order

Carl Cover and a corps of Douglas technicians are now giving the DC-4 "the works" in the air. For ground tests see AVIATION, June 1938.

to provide for adequate testing of the airplane structure, engine operation, propeller and accessory functioning, engine about various parts of the



Douglas engineers work on engine test beds in two percent shop about in flight. The heavy fixtures anchored



from the base of the test bed used to simulate the possible load conditions.



Over 85% of the engine has been installed. The DC-4 has been turned into a complete flight laboratory.



Technicians at work on board the DC-4 in test flight. From test of inter-communication unit.



plane air, it was necessary to install equipment weighing 8,500 lb., nearly twice the normal payload of a modern airliner. As many as 22 engineers and observers, in addition to the pilot, have gone up at one time in the DC-4 to check and record readings of the various instruments.

Of the most than forty flights to date the first few were devoted to control adjustments. Thereafter Mr. Raymond's corps of technicians began to make bigger problems. Engine manipulation, on the ground and in the air, test consumption under varying conditions, vibrations in weak components of the plane, in whole groups, and in the propeller, load distribution, engine characteristics in different attitudes, speeds and operating conditions, and a hundred and one other important matters were all checked with a thoroughness and an accuracy never before possible during actual flight. Engine temperatures and pressures, for example, required blocks for 116 separate lines of data, each carefully filed out during flight.

Engineering charts were prepared prior to each flight to cover the program to be conducted. These were so complete that on there was reflected the exact position in the plane of every instrument and every observer.

Observers sat on comfortable benches in front of large desks on and over which an outstanding array of instruments and controls was arranged. Engine performance, air, fuel and oil pressures, the electrical system, the



hydraulic system, vibrations and deflections of structures, all were checked and double checked. Up in the cockpit Al Reed, test flight engineer, worked the dials and gauges in the instrument boards and directed his observations into a recording machine, to be transcribed by a stenographer on the ground. By means of a complete inter-communication system Reed was able to communicate constantly with the pilot and with the engineers throughout the flight.

The DC-4 has become a familiar sight in the sky above Los Angeles, and she daily exhausts her capacities for reliability and workability with support observers and others who have had the opportunity of watching her. Pilot who have flown her remark on the ease of control and stability.

When the tests are completed the heavy timber racks which now hold the test beds of before in place and which support the dials and benches on which it mounted the testing equipment—will be removed and the interior design system, testing engine tests, engine pressure, fuel and oil pressure, and all the rest of the equipment will be controlled.

For studying vibration of engine and propeller a pickup device was secured on the propeller hub (shown) connected to instruments (shown) in the cabin below. Vibration patterns were recorded on continuous film for later study.





## PLYWOOD Airplane

**Bennett Aircraft, Inc. of Dallas introduces two-  
Jacobs powered ship of all-wood construction**

ONLY 14 LOS ANGELES several months ago we stopped in at a hangar on Van Nuys Airport to admire a ship that Vance Bennett was then test flying, the Bennett B-1, a two-engine, high-wing, all-wood airplane. Bennett's chief engineer, pointed out its features, particularly the high surface finish and the engine nacelles that were made possible by the use of all-plywood fuselage-covered construction. In that respect the Bennett is a new type of airplane, one that is new to the American market. Our designers here, in the past few years, generally favored their lot with all-metal construction. Lately, however, some questions have been raised that would still show possibilities for certain uses, and Bennett is in the front rank of those to transfer that respect into construction, full scale. Actually, the ship around us beautifully finished in many of the high performance sections (look for its test in El Paso). The fact that we met Hawley Bowles at work on the Bennett may have had some significance.

### Conventional Features

The fuselage construction is conventional, with a section of built-up beams and metal stringers, and a

smooth Bakelite plywood skin covered by glass. The wing structure departs from the conventional, as a single spruce construction box and I spar is used to carry the loads. Spruce ribs and Bakelite plywood cover the rest of the wing structure. Bakelite plywood covered aluminum skin of spruce with a steel rib mounted on the right aileron only. Split type flaps, extending inward to the fuselage, duplicate the aileron construction. Tail construction matches other parts of the ship.

The hydraulic retractable landing gear is the simple single fork type. In the wheel-up position the gear swings backward into the fuselage and has flush with the lower line of the fuselage. Oil drains through shock absorbers with right-hand travel. Goodbye wheels and hydraulic lines, which are used.

Arrangements for seven passengers and one pilot are provided in the cabin. Access to the cabin is gained by two doors on the port side. One leads in

the forward, or flight compartment and the other to the rear compartment. Both doors lock at the bottom and open upward, then hinge at their helves) continue to be back on the top of the cabin.

### General Description

(Data and performance figures as supplied by manufacturer.)

Span	36.0 ft.
Length	28.0 ft.
Wing Area	170 sq. ft.
Empty Weight	2,500 lb.
Useful Load	2,200 lb.
Maximum Per. Load (Gross or Displacement)	4,700 lb.
Power Loading	11.5 hp. per sq. ft.
Wing Loading	22.5 lb. per sq. ft.
Cl	1.15
Cl <sub>max</sub>	2.00
Cl <sub>L</sub>	1.15

### Performance\*

High speed	206 mph S.E.
Cruising speed	160 mph at 5,000 ft.
Climb at sea level	1,440 ft. per min.
Service ceiling	12,000 ft.
Landing speed	35 mph
Steepest descent	500 ft.
Single engine cruising	140 mph
Take-off run	210 ft. S.E.
Fuel consumption, cruising	35.0 gal. per hr.

\*Data based on present model with Jacobs L-4 motor. Optional installation with Jacobs L-4, 300 hp., or Wright R-1820, 230 hp., may be provided which will increase performance from 5 per cent to 8 per cent.

### Standard Equipment

Flight and power plant instruments as required by the Department for the type of engine. Door is provided for flight instruments as a separate unit. Complete standard Hamilton Standard Propellers may be provided as additional equipment.



AVIATION  
September 1938



## WRIGHT CYCLONES *Available with* **2-SPEED SUPERCHARGING** *and ICE-FREE* **COMPENSATED CARBURETION**

Two new exclusive engineering features are now available with Wright Cyclones which greatly increase their efficiency and performance at high altitudes.

1. Two-Speed Supercharging, developed by Wright engineers in cooperation with the U. S. Military and Naval Services, produces, in effect, "two-engines-in-one" and paves the way for stratospheric flying.

Two selective throttle valves are provided. In the low-throttle position the Cyclone develops maximum power for quick take-off with heavy loads at sea level, in high-throttle, the engine cranks the added power to greater heights—increasing the efficiency of military and commercial aircraft by providing the high power required by modern operations both at sea level and high altitudes.

Compact in construction, weighing only 10 lbs., two-speed supercharging is furnished at a nominal extra cost, and is readily adaptable to all Wright Cyclone engines in production as well as modern Cyclones now operating in the field.

2. Ice-Free Compensated Carburetion, as accomplished with the Chandler-Graessner carburetor, is standard equipment on the G-180 Series Cyclone engine. Incorporating an entirely new principle of carburetion, it is not only immune to icing but provides mixture strength and power compensation for variations in altitude, eliminating the necessity for complicated mixture control devices.

"Fly With Wright the World Over"

**WRIGHT**  
AERONAUTICAL CORPORATION  
PATERSON NEW JERSEY  
A DIVISION OF CHRYSLER FINANCIAL CORPORATION



The compact Wright 2-speed supercharger which increases Cyclone's rate "two engines-in-one". Weighing only 10 lbs., it can be adapted to all modern Wright Cyclones.



Clearup of the ice-free, compensated carburetor now standard equipment on all Wright G-180 Series Cyclones.

# RADIO

Dialing the Air Waves with Don Fink



## Radio on the DC-4

Includes 230-watt Transmitter and Four Receivers

TRANSMISSION OF AIR IS A SIGNIFICANT part of the Douglas DC-4, recently unveiled by the Western Electric Company, reveals that the transmitter has a power output of 230 watts, some five times that usually used for transport work. Communication is available on any of ten crystal-controlled frequencies. The receiving equipment includes four units, each capable of independent and simultaneous operation. A crystal controlled superheterodyne circuit for communication on assigned radio frequencies and on any desired frequency in the communications band; the sensitivity of the receiver is regulated by a vacuum tube circuit, independent of the master control, which serves only to fix the automatic sensitivity.

A beacon receiver, similar to the communications receiver but operating in the range from 170 to 415 kc, may be used with a single antenna, or with a loop antenna for direction-finding. An auxiliary receiver covers all frequencies in the communications and beacon bands, and is capable of operation from battery supply when necessary. These three receivers are mounted, together with the transmitter, immediately behind the cockpit position. From this panel, remote control valves are fed inductively to a control system between the pilot and co-pilot. Individual controls permit either pilot to connect his headphones with any receiver, without affecting the other headset.

Changes in frequency, made simultaneously on transmitter and communications receiver, are accomplished by a few position rotaries dial on the transmitter panel. Changerover from day to night frequency is effected by remote control from the control console between the pilots.

Provision for reception of the ultra-high frequency marker stations is made in the fourth receiver, a fixed-tuned crystal-controlled superheterodyne which requires no attention in flight. The output of this receiver is rectified and applied to indicating lamps on the instrument panel, while cord monitoring of the marker signals can be observed by switching the other headset from the control console. The status power supply for the installation, exclusive of the emergency battery supply, is derived from the 500-cycle alternator used for supplying the ship's electric requirements. An elaborate automatic system, capable of connection with the telephone lines when the ship is on the ground, connects the two pilots, the flight engineer and the stewardess.

The specifications for the equipment, which was designed and installed by Western Electric, were laid down by the TWA, United, American, and Eastern Airlines.

## New Products

Recent Announcements of Apparatus

THE AERONAUTICAL RADIO CO., an "Ear-Share" for pilots, a 500-watt transmitter connected between the phone jack and the phone, and intended to limit the radio voltage applied to the phone is not more than 12 volts. Shorter cables and other built-in safety features are then added, whereas the modulation of the signal is heard at the usual "conventional" level of 4 to 6 volts. The device weighs 3 ounces, and is housed in a metal box, 2 inches in diameter and 2 1/2 inches high.

By the Curtis Manufacturing Co. of Chicago, a new series of components for the aircraft industry, the first of which is a Tone Oscillator, model 25, built to Bureau of Air Commerce Standards and supplied to such organizations as Bendix Radio and the U. S. Lighthouse Service. Tone for modulation of beacon transmitters, blind landing systems, etc., is derived from the B2.

## Remote Tuning

Lean Motor-Driven Loading Unit

FOR USE with a small fixed antenna which must be connected to a wide range of frequencies, Lean Development has recently produced a motor-driven antenna loading unit. The motor, similar to that used in the Lean automatic hand-loading arrangement, rotates the antenna elements and about its own axis. A rolling contact which rides on the turns of the coil shorts out the inductance when thus providing any required inductance up to the maximum of 60 microhenries. The motor is of the reversing type and is controlled by a switch for increasing or decreasing the inductance. The weight of the unit is 1 pound, 14 ounces.

tion and length of major elements, distance carrier in two-side intervals, call-letter and frequency of the traffic control voice, and range services, and the schedule of broadcasts. All Department of Commerce and Municipal Radio Ranges are included, in-

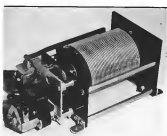
formation of Military and Naval ranges, as well as those maintained privately are to be included as information is made available. The service includes replacement of charts as revisions are necessary, on a two-year-month schedule.



Antenna loading unit "The-Servo" is a vacuum tube for antenna use



Though low voltages for modulation



Motor-driven unit controls antenna loading

## Publication

Lowest Data on Radio Range

A CONVENIENT AND EASILY ATTACHED SOURCE of information on radio range stations in the U. S. is made available through Wm. F. Ward of Dallas, Texas, who publishes "Fountain of Radio Range Data" a loose leaf booklet of data and facts. A typical sheet, that showing the data for the days is shown in the illustration. On each sheet are included the true magnetic bearings of the beacons, both to and from the coast of reference, the position of the A and N sectors, and pos-



Radio range station data



DC-4, top, mounted in the non-reversible

Transmitter, four receivers, and interphone amplifier mounted in the DC-4



## IT'S FASTER

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Minutes Each Assembly Hour

## IT'S SAFER

Driver can't slip from  
screw's recess

## IT'S STRONGER

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tighter and more securely



This is the Genuine  
Patented Phillips  
recessed head

—proven most successful  
for all types of industrial  
fastening

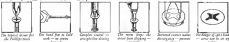
Now the biggest reason for the  
success — its design was worked out  
after months of tests to determine  
the most efficient form of recessed  
heads, utilizing size, distance, angle,  
round, tapering power. With the big  
advantage — the corner design of the  
rivet. That generates the driver from  
turning the screw. One design is  
indispensable to give us success — it  
is, in essence, a perfect fit.

MEANWHILE, quality won't suffer. In fact, quality is  
improved — as evidenced by the fact that many manufacturers  
are instructing workmen to make a sales point of the new fasten-  
ing method. The public is learning that products assembled the  
Phillips way are stronger, more resistant to vibration, better-  
looking and safer. Any of the manufacturers listed below will  
tell you more. Ask for Folder B.

### the "WASTE TIME" way



### the "SAVE MONEY" way



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FEWER DRIVER SIZES — 3 sizes of Phillips Drivers fit 85% of all  
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sizes, known of T as with slotted screws. Made by many leading  
driver manufacturers. Ordinary drivers can also be used.

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assembly, less spoilage, fewer screws, longer tool life, better worker attitude. No  
wonder they say, "We could not afford to be without Philip's Recessed Head Screws."



# Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment



## Portable X-Ray

Equipment and dark room mounted in trailer

WITH THE GROWING IMPORTANCE of x-ray examination of materials used in aircraft construction, several firms have specialized in the work of supplying x-ray equipment in this field. Among these a rather unique application has been made by the St. John X-ray Service, Inc., of Long Island City, N. Y. This firm has developed a complete x-ray equipment mounted on a trailer so that it may be towed from place to place for x-ray study in plants which cannot afford, at this time, permanent x-ray laboratories. The St. John equipment is compact and complete, weighs approximately 1,000 lb., complete, and may be towed by any ordinary truck car with ease. The trailer may be used as a field dark room. The x-ray equipment includes a new tube which is capable of penetrating 2 inches of steel for a complete exposure.

Interested manufacturers may contact for the review of this equipment, or the St. John Company will mail such portable units and their references to their use.—*AVIATION*, September, 1935.

## Measures Bumps

Kohlsaat Measures Service and Test Accessories

KOHLISAAT INSTRUMENT COMPANY has developed the Type 352 accelerometer, an extremely rugged instrument which does not require locking of its mechanism during transportation or in storage, and which will not measure error due to extreme shock or excessive vibration. The design is such that there is no error in indication due to acceleration in a different direction. The instrument contains two pointers, one indicating continuously and the other showing maximum stress value instantaneously until reset by a small knob at the bottom of the dial. A new line of accelerometers particularly suited for performance testing has also been introduced by Kohlsaat.—*AVIATION*, September, 1935.



Photo indicator airplane type turbine indicator.

## How Tight?

An Airplane Type Tension Indicator by Martin-Decker

THE ADVENT of large multi-engine aircraft has greatly increased the number of twisted cables used, which makes the use of some accurate cable tension indicating device essential. To meet this need a special airplane type tension indicator has been offered by the Martin-Decker Corporation, Long Beach, Calif. Made in two years, Models 2 and 1, the Martin-Decker airplane type tension indicator is light and compact. Model 2 weighs 2 lb., 9 oz., takes cable size of 3/16 to 1/4 in., and has a capacity up to 250 lb. Model 1 weighs 2 lb., 15 oz., takes cable size from 1/8 to 1/2 in., and has a capacity of 300 lb. Both instruments make

use of a cylinder incorporating a pressure diaphragm and a gauge for transmitting line load into pressure corresponding. Two fixed and one movable cable contact points in the base of the instrument serve to take it in a cable for test. Provision is made for adjusting for temperature changes and for compensating for cables of varying size within the capacity of the instrument.—*AVIATION*, September, 1935.

## Spotlight

S & M. landing lights installed on Hagler Lockheed.

SPECIALIZING in spotlights for vehicles of all types, the S & M Lamp Co., Los Angeles, Calif., has developed many unique lights for automobiles, airplanes, or aircraft use. The standard line of S & M. aircraft landing lights includes a series of retractable lights, a series of landing edge lights, and a series of lights for installation in fuselage zone, etc.

In connection with the recent flight around the world by Howard Hughes two landing lights were installed in the fuselage of his Lockheed 14 beyond the wingtip zone zone, one a standard landing edge landing light, and the other a special ball ball indicator spotlight searchlight.—*AVIATION*, September, 1935.



Kohlsaat accelerometer.



S & M. lights on Hagler's plane.

# MENASCO OVER POPOCATEPTL

Wherever the going is tough, Menasco engines defy prove their championship performance, smooth and dependability. True to this tradition, the Menasco 150 h.p. supercharged engines that power the Menasco Air Force find of Ryan trainers are doing an outstanding job taking off from Mexico City at 7,200 feet and flying in formation over Popocatepetl (Mexico's highest extinct volcano) these engines must deliver loads as performance at well over 19,000 feet. Whether your choice is the handy 50 h.p. Menasco for light planes or the sleek in-line 260 h.p. supercharged Menasco, you can be certain that no engine in the world can score so expertly engineered, assembled with such exact precision or tested with greater care. Menasco Motor Manufacturing Co., Los Angeles, California.

**TM**

ANY AIRPLANE SELLS BETTER WHEN POWERED BY MENASCO

AVIATION  
September, 1935

AVIATION  
September, 1935

**ABILITY TO PRODUCE**

"Delivery" often assumes importance equal to specifications. Back of Consolidated's success in the air, is one of the world's newest and most modern aircraft factories. Over 650,000 square feet of floor and yard space. Planned exclusively for large-scale aircraft production. Located in a favored Southern California clime where "weather" does not interfere with production schedules. Consolidated possesses unusual ability to produce.

**Consolidated PBY Series**  
Available for export  
Amphibian gear optional

**CONSOLIDATED Aircraft CORP.**  
SAN DIEGO, CALIF. EST. 1923

# THE AVIATION NEWS

REVIEW COMMENT FORECAST

DAVID LAYNE  
C. F. McHenry, Pacific Coast  
Editor, San Francisco, Washburn  
& T. L. Loebe, New York

SEPTEMBER 1938

## Nazis Run Off With Atlantic Show

(Story on page 54)



**SO HELP ME!** Aug. 8 Judge Winifred M. Stephens of the District Court of Arizona administered the oath of office to the new Civil Aeronautics Authority in the reception room of Gary Rogers Commerce Building Office. Left to right, facing Vice Consul and Consul J. Kohn, Chairman; Marjorie Sprague, Vice Chairman; S. Grant Mason, Jr.; Donald Speer; Robert Hinkley and Clinton M. Steen, Administrator. Story on page 57.

**OFF FOR ALASKA!** Early last month Pan American Airways began today begin another link in the web of its long air-line system. The survey a route between Seattle and Juneau, Alaska, it will a Sikorsky S-40 amphibian on a 2,600 mile transcontinental from Miami, to Seattle via Glendale, Cal. The crew stood up before the takeoff at Miami, left to right—Communications Officer Earl S. Martin; Engineering Officer John D. Bonnell; Pilot Flight Officer J. Herman Gentry and Captain John M. Martin. Story on page 59.



AVIATION  
September 1938



# Germany Grabs Atlantic Spotlight; England Exits Briefly; France Waits Cue

IF THERE WERE AIRPORTS TO BE HAD who could put on the last show this summer, the North Atlantic would right now be ruled out as a German arena. Promptly on schedule the seaplane, Deutschland, enlivened all the Atlantic, took the Dornier-powered seaplane Maryland down its catapult on July 31, left on schedule the Nordenskiöld in mid the Irish Washington, Long Island has a little over 15 hours left. The next Monday evening the seaplane, Deutschland, enlivened in Long Island Sound, shot the Nordenskiöld of top bay attack ship. Meanwhile the Nordenskiöld had arrived that morning. From then the two ships to stand complete, the Nordenskiöld is standing in line at the Atlantic have been quietly shadowed back and forth. One comes in every Sunday morning; the other stays back that evening. And they're going to keep that up all summer, right into the middle of Oct.

But then, after all, it is all over. The Germans cleared up the same technique last in the Fall of 1934 and then

suggested it all over Germany—the same ships (except for the Nordenskiöld which is never and a little faster) every of the same pattern. So, on Aug. 15, with very little time to spare, the Germans sent to Captain Alfred Rode in a big Focke-Wulf Condor transport powered with four standard engines

Front 4-Wing Condor (built by E.M. H. under license). That was something. The "Deutschland," against strong headwinds, covered the 3,000 land miles of the non-stop distance between Berlin and Floyd Bennett Field in just under 33 hours. It was mostly a demonstration, and Capt. Rode. Although the ship normally carries 32 passengers on Luftwaffe runs, on the Berlin-N.Y. leg it would have carried only a very moderate mail load. Perhaps the Germans hoped, the flight would end America's attention to Germany's seaplane flights. That's all there was to it. Aug. 14, the Deutschland started out into the sea,



FROM BERLIN: The big Focke-Wulf "Deutschland" refs to a ship.



FROM BOSTON: The Deutschland Hamburg-style seaplane wing in a variety of ways. These "Deutschland" will run well into October.



QUESTIONS: Captain Alfred Rode in the Deutschland steps aboard at Floyd Bennett after his flight with three seaplanes from England.

CONGRATULATIONS! Capt. Hans Werner Von Engel of the Nordenskiöld (right) comes home with Capt. Joachim Winkler of the Nordenskiöld after the latter's arrival at Fort Washington after his hand-to-hand meeting at the (North and South) Atlantic.



FROM BATTLEFIELD: The Albatross "Albatross" is due over in early September.

way and raised off again. The time, with a good tail wind at 15,000 ft., Rode pushed along to land at Washington in 15 minutes under 30 hours. Arrivals speak, meeting a dinner around a fire, something just over 200 each. Now talk to the German government will give Rode another plane to push around the world in another "Deutschland". What all this German effort is going to mean in terms of U.S. personnel for a German seaplane to operate in our ocean is not yet clear. However, America's steady refusal to let Germany operate here and some American company is good and ready to operate in Germany. Somebody better be looking.

The press writes for our British seamen, talks for less time on the summer's start. But the good spectacle part none the less. The Navy Ministry found by way back early in South America on July 21 after stops at Montreal, Montreal, the Aurora, and Lough—its first time anyone has taken that route for some years. As we go to press it is expected back here on a second visit about any day. The general reaction among American seaplane men is that the whole group has a new lease (British) just back complete) the has now been fully demonstrated as feasible. Its main importance, however, will probably be more military than commercial. Cheap small seaplanes might well be first given a boost up at the start of a mission and become the more formidable for it. Commercially, however, ocean development is a great plant, people and plane design seem to make Mr. May's career plus also late before it gets really under way.

Back with permanently returning in the visit of the battleship "Albatross" seaplane scheduled for early September and the seaplane (possibly after re-fueling) of the battleship Empire Post, "Albatross" scheduled for the end of the same month. The Albatross is a seaplane of extremely sharp lines and of wood and plastic construction. Its design is regarded as a big success, but its four Gipsy-18 engines of 100 hp each give it a cruising speed of about 112 m.p.h. It will be definitely something to see.

All things come to be straining it has typically Gable failure to get in Germany at last, with her big, old Luft. de Vauxen Paris. She could stop



CONGRATULATIONS: The man who proved "Albatross" practical. Left to right—Major A. H. Wye, the designer, Capt. Winkler, pilot of the Navy A. J. Corder, commander of the Navy and Sept. 2, C. T. Bennett, his pilot.



FROM SOUTHAMPTON: The Navy rises at anchor at Fort Washington.



FROM BISCAROSE: The veteran Lind, de Vauxen Paris is scheduled to keep "any day" for New York. Six roundtrips were on the original plan.







Japanese plant during the remainder of 1961, with a fair amount of business earned over rate 1959. The business on the books of the company division, while less than shown six months ago, is still sufficient to maintain normal operations during the balance of this year.

**Federal Judge Walter C. Lindley** has granted authorization for Stinson-Diamond Aircraft Corporation, of South San Francisco, Calif., to file for reorganization under section 77B of the Federal bankruptcy laws. Bendix Aviation, Ltd., and two other firms had filed involuntary bankruptcy proceedings against the company.

**Not operating because of Elmer Alchian and Stuart Corp.** for June was \$1,107 according to East Haven, Conn. The company is reorganizing under section 77B of the national bankruptcy act.

**Aeromarine Controls, Inc.,** has been awarded a Lockheed City, Calif., to A. A. Lockheed, in manufacturing and market a new species of automatic flight control system to be successful. Satisfactory flight tests are reported to have been completed and acceptance of the device is said to await only official ATC

**Spies American Company** took a short during July and August. Major order was a \$100,000 contract from Lockheed for the extra contract work.

field requirements for the Lockheed 141 being built for the British government. This order means that on the basis of another contract almost as large for Spies contract specialists to be included on U. S. Army tenders of its national make. Spies's current manufacturing division continues to permit on the subject of U. S. and R. & D. development of a healthy rate. Substantial foreign orders on the ATC military contract continue to come in. The Spies group when next set \$750 to Guatemala, which believed several shipments of engine planes to Mexico and Honduras.

**Monaco Manufacturing Company,** has announced major expansion of manufacturing activities in four separate

plants. While rapidly expanding production of the standard line of Monaco aircraft engines, the company is expanding its production of the new "Gyro" powerplant developed for Vesp Aircraft Company, Berkeley, a Lockheed subsidiary. The standard line of Monaco engines include seven models ranging from 40 to 124 horsepower. The "Gyro" powerplant encompasses two of the 200 hp. "Gyro" engines, which are a dual cylinder, four stroke, a patented four cylinder gas turbine. Flight tests made by the Vesp Aircraft Company have been promising and additional production is scheduled.

Other Monaco activities include advanced machining contract work of a specialized nature for Lockheed, North American Aviation, and Douglas Aircraft Company. The British units in Lockheed and North American have placed a premium on rapid production of various machine parts and the Monaco plant is meeting these shifts in some departments.

Final plans of Monaco activity were announced late in July with opening of a contract involving production of six thousand Civil Guard engines for the Spanish Government, of Gerdau, which holds American sales rights in the engine engine. Monaco engines are now shipping the Civil Guard to Spanish production standards. Production of 18 engines per month is scheduled.

**The first dividend in three years** for shareholders of Douglas Aircraft Company. The first dividend was in 1959, when 75 cents per share was distributed. Donald Douglas, president, has announced that net profit for the first six months of the company's fiscal year was equal to \$1.81 per share. Earnings for the full year are estimated at between \$2 and \$4 per share, depending on the charge-off policy applied to the cost of the D-4, which is presently undergoing flight tests. It is believed that final decision on distribution of a dividend may be deferred to the end of the fiscal year, November 30.

In the meantime Douglas officials are

about to hold off the SEC. Following recent withdrawal of the National Labor Relations Board action in Douglas to maintain D-4's C-42, 100-hour system, action of which had been convinced of Douglas, the board began a new open hearing in Washington August 1959.

**Spies Aviation Supplies,** a new name in the aircraft supply business, is expected to be formed by Spies Aircraft Corporation, of South Los Angeles, with a new division in South Los Angeles, where a new room has been started for the display of all classes of aircraft and engine supplies.

## PROFITS AND LOSSES

**AVIATION CORP.** and subsidiaries for six months ending May 31, a net profit of \$149,590 equal to 14 cents a share compared with a net loss of \$14,138 during the corresponding period in 1959.

**TRUCK AIRCRAFT** for the same months ending June 30, a net loss of \$14,197 1/2.

**CRISTIANI-WRIGHT CORP.** a net profit for the June quarter of \$149,590 equal to twelve cents a share. Profit for the first half of 1959 total \$2,152,000 equal to thirteen cents a share. Wright Aircraft's share of this profit was \$1,051,000 for the second quarter and \$1,099,200 for the first half.

**DALLAS, INC.,** Los Angeles aircraft equipment manufacturers, a 12 per cent net income dividend based on appropriation of \$50,000. This takes effect September first to all shareholders on record as of August first. Dallas also includes research, testing, and special equipment for extensive of making guns and faps.

**NORTH AMERICAN AIRCRAFT, INC.,** Longwood, Calif., a consolidated net profit for the six months ending June 30, last, amounting to \$400,775 after all charges. In addition the company received \$122,222 (after provision for Federal income tax) in excess of book value on sale of its six transport division, Western Air Lines, which was transferred directly to capital surplus. Profit for the first six months of 1957 was \$108,000. Declared dividend as of June 30 amounted to \$149,590, against \$1,099,200 at the end of the last year. A major expansion of factory facilities is now under way at the Longwood plant, increasing capacity by approximately 50 per cent.

**TRUCK AIRCRAFT CORP.** for the quarter ended June 30, a net profit of \$1,042,670 equivalent to 33 cents a share. To \$100,000 on hand June 30 included \$2,152,000 compared with \$22,222,000 a year previously. Total profit for the first half of 1959 amounts to \$1,042,670.



AGAIN the United States of Brazil turns to her northern neighbor for an outstanding product to serve in more closely uniting the vast territories of this great South American Republic. The effective patrol of 5000 miles of coastline and vast jungles, plantations and rugged plateaus which surround Brazil's industrial centers requires fast, dependable equipment. To meet these requirements the Brazilian Air Corps has selected twenty-six Vultee V-110B2 Attack Bombers, built with Wright Cyclone G-1020-G2 direct drive engines.

**VULTEE AIRCRAFT, DOWNEY, CALIF.**  
Division of Aviation Manufacturing Corporation



**PAR FROM HOME:** Three Ryan 6-146 Military Trainers land at Guatemala City for use in the long flight from San Diego in Toluca, Honduras where they will be used for training purposes by the Honduran Air Force.



## LOGGING THE LINES

### Air Transport Profit Sights

By DAN GATRE



#### Traffic continues below '37 levels

We should feel out of our shoes last month when the jet was thought to have almost hit us as a late 1930s product. Across the back of it was the slogan, "New Children Fly As A Bird" and some in the past, very explaining the new idea. Then down at the bottom were three signatures with initials—American Airlines, Transcontinental, and Western Air and United Air Lines. The big hand-drawn and airplane getting together on some good sailing? To top that off we heard the same week from three different sources that the line—possibly very late out of them—will get together on joint advertising for six weeks' free business card year. And then, if that wasn't the hope they all go along on a permanent basis of progress. That makes the main issue in this department of anything we've heard this year.

(Chicago & Southern reports an increase for the first half of this year of 68.2 per cent in revenue passengers carried over the corresponding 1937 period. The Valley Line Route also continues. That is in new co-ordinating plans as the ground at Chicago and St. Louis. That it has opened a joint ticket office at Memphis with American Airlines. That it has received a simple and certificate to its function of capital

conferred, James Day, as "America's No. 1 Type and Open Machine."

**Tri-State Airlines Corp.** has the latest word on the experimental air mail service called for by the Post Office which will be opened Sept. 15. Tri-State, of which Dr. Lyle H. Adams is the president, has been operating since last March with such a pickup-and-delivery-Delaware service for express to the P. O. box route for mail. And, of course, to prevent anyone from making it to New York via the air mail, the Philadelphia-Pittsburgh and Pittsburgh-Philadelphia routes specified in the bid contract. There are 26 stops listed on the first route, none to be discussed and a stage out of Chicago to pick up 21 more miles. The bids are valued for under an appropriation of \$180,000 in the last delivery bid passed by Congress.



Charles Otto H. Brown, TWA pilot, "for a hour of duty with the Air Corps during which he logged 26 hours on the Great TWA-17 four-engine bomber, has been named chief instructor in a 'school' which will train other TWA pilots on four-engine bombers against the delivery of TWA's Boeing 801 Superfortresses. TWA has appointed William J. Austin, of Pittsburgh ("Manager of National Accounts" in the traffic department. Austin had been in charge of Penn-Central for the past several years. TWA revenue passenger-mileage for the first half 1938, month ended 10-31-38, TWA's 201 per cent ahead of the same period last year.

**Rub the same Western Airlines** out of this level of prices. The same line, the same management, the same operations will be brought to the fore as Mid-Continent Airlines, Inc. By any name wherever the company is rightly placed with current business. First quarter traffic rose up 215 per cent over last year. The second quarter also showed a big improvement.

**United has named F. E. Colwell**, formerly Director of Operations, as the new Director of Operations, in charge of operations. Ted Johnson, formerly assistant to Colwell, has been placed under Chief Pilot, E. T. Young. Object to establish all responsibilities on carrying flight operations. United, covering the aircraft's territory of 14, N. T. Co. Inc. based now 40,000,000 miles in its last half but that contract of its aircraft. United revenue passenger miles for the first six months totaled 61,000,000 as against 38,000,000 for the first half of 1937. Full-flight in July was 11,800,000.

**Two accident reports** have been received recently by the F.A.C. The first, dealing with the probable cause of crash



leading to TWA's crash in Tuscon last March, makes a remarkable reconstruction of the probable cause of the plane and the pilot's mistake to get out of his difficulties. With worth the study by any air line's operations man. The second explains Northwest's accident July 9 as follows: The plane took the ground in a sudden position. The pilot tried to recover. A ground-slip on the quadrons at the propellers caused severe damage to the engine cover available. The plane slid off on the right wing and crashed 1,100 ft. beyond the end of the runway.

**Western Air Express** has over 1,000,000 passenger miles in its branch to better position during July, an increase of 400 over June and 275 over July, 1937, according to Alfred D. Adams, president. New lines 4,000 passengers were carried in the month of July, an increase of 215 over June and 215 over July a year ago. For most passengers carried 80 for a new high total of 17,000. Adams attributed the substantial traffic

increase to a general improvement in business conditions, heavy summer season on travel, and improved Western Air Express airport facilities in the vicinity of the Yellowstone and Glacier National Parks.

## AIRLINE INTERVIEWS

We was talking to "Master of the Line" in our last French dictionary and as near as we could make out United had given Don McQuinn the title of Board member. That seemed something of a bit hard to be for an airline. When Max Strangulowski, N.Y., spoke up as a help out. Strangulowski, who did McQuinn's work for a while. "Gosh, Mr. McQuinn's business to explain, that Strangulowski was just some great agent's guy. . . . How much under Chief Secretary or Superintendent of the Company, had the job of 1938. And he had called on to study United's whole food problem. He made two recommendations.

United had more or less been challenged to work them out. . . . (He'd taken off his hat and coat and hadn't stopped working them. . . .) The two recommendations? Well, the first had been that United should cut its food bills by \$20,000. And any one who ever studied our status on it can see how that would be the second—get away from phony meals and that food checkers which had been so often so named was making them spend just that.

The Twenty-Grand part was, a second, really pretty simple. United's huge food expenditures (United will serve 400,000 meals this year) the line was buying all its meals from hotel restaurants or restaurants at retail prices. McQuinn, that simply suggested United should prepare out of its own food wholesale. By Dec 30, 1938, he had set up a \$2,000 company at Chicago to compete with a good chef, Strangulowski, on. During 1937 it saved \$50,000 over the price United had been paying. Now he had companions at Oakland, Chicago and Portland and was ready to set up the set of this twenty-grand offer. Costs would be down to about \$1.50 per tray and passenger meals this year.



United Air Lines' new \$200,000 building at the Chicago Municipal Airport is air-conditioned, sound-proofed in important sections, and fireproof.



A complete kitchen equipped with Magnatrol and No. 10 stoves. (Continued)

The Butler, Maids Company got a big break, right at the start. United was just changing over to DC-3s and



**DON MACQUINN**, in the quiet opinion, going down into about Dec. 1938 has been what United Air Lines calls the Master of the Line. He's only 33 but he knows his airplanes. Born and raised around Council Bluffs, Iowa, he entered United in 1929 to take the course in Hotel Administration, left almost immediately for a waiter's start in the chain field. For more than a year he worked in hotel, hotel, hotel, worked in Philadelphia and Washington hotels, then landed a job with N. M. Grinnell Co., a firm of accountants. During the next ten years, Don went from hotel hotel, hotel, hotel or wherever he was working taking the pleasure out of the work, pulling the company up out of the red ink, taking matters to across the camp with only one exception. In the Fall of 1933 United Air Lines turned up in Don's door. assignment.

## AIR TRANSPORT INDICATOR

August 1, 1938  
92.7

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during July 1938, to the corresponding figure for July, 1937.

For the latest time in seven months the indicator stood at under 100. First quarter figures follow: 1937—108.741, 416, 1938—103.342, 614, up 14.4 per cent.



## -LES SEYLLS



### Prairie Airways Gets Canadian Feeder Contract

**FIRST CANADA** PIONEER LONG CONTRACT was let recently to Prince of Wales, Ltd., with head offices in Moose Jaw, Sask., to build a line from Prince Albert to North Battleford, south to Estevan and Moose Jaw, connecting with Trans-Canada at Regina. When operation of the line is well under way, it is expected that similar feeder routes will be established under the supervision of the Canadian Post Office Department to tie in with Trans-Canada Airlines.

The first of *Prinair Airways*, Ltd., was based on the certainty of a restored Model 18D *Boeingcraft*, monoplane. The standard ships were delivered to *Prinair Airways* in July, and a third one, which was to be the last, was ordered in the fall. Delivery of the first ships was completed at the *Bombardier Aircraft Factory* in Verdun, N. B. Egan, general manager of *Prinair Airways*. The transports were flown into Canada, and at a point by M. V. Gillard, chief pilot of *Prinair Airways*, the host-towing the factory on July 2 and the ship was taken off July 10. The ships were painted in the colors of *Aerobus* Ltd. of Montreal, N. W. Canada. *Prinair Airways* is a subsidiary of *Bombardier Aircraft*.

The interiors of the planet have accommodations for seven passengers and two pilots, and are luxuriously finished throughout in a medium shade of blue. All governing safety devices and features of accident have been incorporated in the twin ships. Complete soundproofing, soft comfortable chairs, and perfect ventilation are provided. Ordinary room temperatures can be easily maintained when the outside air temperature is  $-30^{\circ}\text{F}$ .

Improved stalling, in a stall is created by a built-in seal at the top of the wings from the water to the frame, raising a maximum windward of 31 degrees which prevents the water from stalling at the wing joint. These 31 large have been installed for the stall and from the water to the water. Likewise, the plates are equipped with slits for water circulation.

Fully loaded, the Prairie Answer ships powered with the 330 hp J/260 1-4 engines have a landing speed of less than 30 mph and will take off with a run of only 100 feet. The ships have a cruising speed of 165 mph at 8,120 feet, and yet will not burn more than 20 gal. less of gasoline per hour. The pilot



in 1987. These data suggest that the

will assume as the sales go down with one motor, taking only 75 per cent power output from the line motor. It is an interesting fact that the Minneapolis Northwold was conceived in 1904 if one of the motors fails in service, providing a speed of 50 miles per hour on the normal has been attained.

The engine is a heavy-duty, computer-charged type that starts at 350 hp at 2100 rpm, then slowly drops to 2000 revs/minute with available power for take-off at 340 hp at 2100 revolutions per minute at 50 inches of mercury manifold pressure. The available emergency power output of the engine is more than 550 hp.

A 304 cubic inch piston displacement engine has to go to be developed and produces 1400 power at low revolutions per minute and low manifold pressure.

For these details we are indebted to E. M. Perkins of the Bosch Company.

The MAA and Private Flyers Association announced an agreement under which PFA secures representation of MAA's 1000 members in private flying matters. New governors of PFA are: Nancy-Ann Presbiter, Mrs. Dan Erickson, NAA Secretary Wilbur

B. Export, NAA Executive Committee: James Webb, and Aero Chamber Vice President Charles E. Parker.

By the year working girl no longer has she to go to have a flying club all her own. Starting in New York, and hoping to spread all over the country, Sports Inc. has just been organized through the efforts of Nancy Schwartz (president) and a group of other working girls including Virginia Treloar (vice president), Alice Nephew (secretary and treasurer), and Cynthia Chappas (recording secretary). Crystal Morry, who holds a lot of feminine flying records, will do the instructing. Alice is chairman. Inc. at 315, Fifth



**WORKING GIRLS:** Nancy Silverton and Crystal Maury plan to bring right girls' education to the down-trodden ladies who have to work for a living.

REVISED  
September, 1979

50

time will be available at a national level and ground instructions. Open to: One of the new 50 hp. Paper Cube will be used. Opportunities to earn flying time will be provided. If interested get in touch with Neogy at Derivation Inc., Room 250, 658 Fifth Avenue, New York.

Joe Flosser's "Hessaville Gazette" tells us that a new blue and cream Fw190c 24 (Warner) has been added to the fleet. It also reports that a Messerschmitt Ju88A 32 made its appearance at Hessaville recently and has attracted much attention.

**Speeding of the Aerozeta "Glad"** (100 hp. version), an assembly plant for this model has been established in Copou.

ingen, Denmark. Operative will be Louis A. Kristad and Aage Rindell, general manager of ERA Corporation of Copenhagen. Early in July the first of the Fralife powered "Chiefs" left Copenhagen for Copenhagen.

Four full days of model flying commenced the Eleventh National Championship Model Air held recently in Detroit under the sponsorship of the local Kachuga Club. A complete program of contests were carried out under the supervision of H. M. Hollins and Arthur J. Viny and business arrangements were under the direction of Veterans Model Aeroclub President Irwin S. Felt.



**HEADS NONSCHEDULED OPERATORS:** D. P. Linnach, former California pilot is now president of Non-Scheduled Airlines, Inc.

**C. E. Lissach**, *referee*, **California**, also and former president of the Southern California Chapter of the National Aeronautics Association, was absent president of NAA's scheduled Aviation, Inc., at a board of directors meeting August 14th. Other officers absent included: Edward A. Dwyer, vice president for aircraft operations; Judge B. Ray Schmitt, vice president for private aircraft owners; Carl C. Meadows, vice president for San Joaquin Valley; and John W. Hines, president for San Francisco Bay area. Doug Nelson, vice president for San Diego area; K. C. Hawkins, secretary; Raymond Ellis, treasurer.

Several hundred membership applications were reported on hand as the first date of officers was chosen as, and on a tentative goal of one thousand members was announced as first objective in the organization's campaign to unify the non-schedule gasoline industry. A number of committees were appointed to undertake special work in various fields, including Insurance and Financing. An executive committee of five men was named to act for the board of directors; this committee consisting of: C. F. Linenbach, E. A. Dwyer, E. Ray Schaefer, K. C. Hinkins and Reginald Elkins.

**New Tiger Cub Activities.** In the New York territory are the Bowman-Johnson Flying Services. Their ships are now available for demonstration and instruction at Hanger E., Roosevelt Field.

Grants awaiting the arrival of Howard Hughes witnessed the landing of Q 4 Whiskey's twin motorized Bessiecraft following a 1,000 mile emergency flight from Sheridan, Wyo.,—flying time 19 hr., 40 min. The ship had been transformed into an air ambulance to accommodate Dr. and Mrs. Arthur Shapiro, who were seriously injured in an automobile accident near Sheridan.



**FOR RUC ENGINE.** This air-to-air suspended type test stand for high output engines has been completed by the Pacific Automotive Corporation at Burbank, Calif. It is the only installation of its kind on the coast.



**ENGINE BY AIR:** Carl J. Friedlander (left) Aeronca Vice President receives the first M-18 by Lycoming engine, delivered by airplane by R. E. Palmer (right) of Aeronca Manufacturing Corporation. This type of engine will power the new Aeronca "Whirl."

Being a high line of Cals popularity in the Pacific Coast, Aircraft Associates, Inc., distribution in California, Arizona and Nevada for the Piper Cub and California distributor for Beechcraft Aircraft, has moved into the greatly enlarged quarters of its new home on Long Beach municipal airport. Providing ample hangar space, shop room, storage, office room, etc., etc., the new Aircraft Associates headquarters is an excellent example of what the aircraft distributor headquarters should be like, and what a substantial business the distribution of aircraft is proving there has become. The headquarters building measures 120 by 244 feet and has more than 35,000 sq. ft. of floor space. In addition to distributing Cals and Beechcraft planes, the Aircraft Associates organization manufactures and sells riverable sail which is applicable to practically all makes of light aircraft (the page 40). President of the company is Harry Martin, but known James pilot of Southern California. J. W. Martin is vice-president and W. R. Martin, secretary and treasurer. There are 25 partners in the corporation. Cals sales in 1937 totaled 42 and Beechcraft sales during the first four months of 1938 15 new Piper Cubs have been sold and ordered.

The Lockheed Kentucky Model 4000 Airplane has been issued by the Lockheed Flying Service, Inc. for a period of four years. Officers in the new corporation are Mr. J. Tyler Thomas to president and general manager, assisted by Mr. John Gerst, Mr. Thomas is the former owner of the Lockheed Flying Service, which operated in Los Angeles, Calif. John C. Bennett, Jr., is vice-president, and Mr. Cole Austin is secretary and treasurer. Both Major Bennett and the Thomas are active in the Lockheed Flying Service.

The Lockheed Flying Service has greatly improved the airport and hangar. Boundary markers have been installed but as yet the field is not marked at night. They have built a small administration building with seating room, office, stockroom and bed room, they also maintain service on the field at all times. Highly reliable protection is available.

Reports from Gloucester, G. S., indicate that rapid progress is being made on the construction of the airplane terminal facilities there. The new runway is almost complete and the administration building construction is moving ahead rapidly. The site is on the Atlantic River near the Municipal Yacht Basin.

Over of Orlando, FL. Wilson is making up a lunch restaurant for 300 persons to be held October 4, 5. Conference are headed by the Honorable S. T. Way, awarded mayor of Orlando.

Texas Flying Service, Inc., has incorporated a charter service at the Municipal Airport. Floyd Thomas is manager.

## REPORT CARD

### At Air School Developments

Two new ground school courses are announced by the Piper Aircraft Corporation. They, jointly sponsored by the company and CCA Educational Division, P. O. Kerner, of the Empress, Paines, Corp., will be taught directly by members of the Piper factory staff—William E. Kerner, representative, Edward E. Kerner, Kerner Kerner, Thomas C. Kerner, Van Kerner, and others others are yet announced. Experiences of Commercial Inspector Joseph Kerner should give the students. Following a course in aircraft construction, aerodynamics, theory of engine, engine maintenance and safety, an airplane will be chosen for practical training in aircraft building in the Piper factory. The second course, and directly sponsored by the factory, is the extensive integrated ground school begun in August by the Cals Plant of America for members. Experiences are prepared by members of the Lockheed Chapter who are "teaching" representatives of the Piper Company. They are: Raymond Edward Kerner and David Long and Division Representative Howard Van Buren and Richard Kerner.

Good background and substantial experience for the career and the member will be given by the Piper system of instruction. Activities, M. at the Piper Corporation in Philadelphia and Dayton, Pennsylvania in New York. The course is a dual endeavor will be completed before the Christmas holidays while the advanced course is scheduled to end in the latter part of April.

More emphasis on the production process is being given to the students. The company is planning to place in more recent versions of the engineering curriculum of the Lockheed Aircraft Corporation.



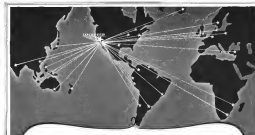
Spartan School occupies this attractive group of buildings at Tulsa

Chief Engineer F. H. Shady, of the school, states that the aviation applicant in the drafting and structural division of the engineering course, as it is essential that both the draftsman and the stress analyst be thoroughly acquainted with these problems and their factors affecting production costs. The new long training courses at Commercial Wright Tech is now opening after a month's delay and period. Built by students, under the direction of Al Stronberg who is in charge of the sheet metal shop, the building is 11 ft. long, 4 ft. high and 18 ft. wide. Equipped with a 20-ton electric power generator, it now contains a machine shop, carpenter's shop, and a paint shop. A part of the new course in mechanical engineering for engineers now includes a 22 ft. long, 11 ft. high and 18 ft. wide.

Expansion of the engineering department of the Spartan School of Aeronautics has necessitated its removal into new and enlarged quarters in the main Piper administration building at Long Beach, Calif. The engineering school is under the direction of Henry H. Brown, who knows design and construction of the aircraft and also in the design of the aircraft. The school is in charge of all Piper Aircraft Company flight testing during Wilson's two-month absence.

The new term study course started recently by Commercial Pilot School at Long Beach is well underway, according to H. Brown, president, in front of the school. The course is to be followed by practical flight training in shop practice.

Training in the location of spray painting and the use of the airbrush for that work is offered by the Cals Plant of America, manufacturers of paint spray equipment. Classes lasted one week from August 2 to 20, October 2 to 11, and November 11. Speed studies had been set aside.



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**LOCKHEED AIRCRAFT CORPORATION, BURLAND, CALIFORNIA, U.S.A.**

# Again Western Electric leads

this time with  
**NEW 27A RECEIVER**  
for Marker Signals

The new 27A Radio Receiver—Western Electric's latest aid to air navigation—was designed by Bell Telephone Laboratories and built to meet the joint requirements of the country's major air lines.

Private planes flying the airways will need this new receiver. Operating on a frequency of 75 megacycles, it provides for indication of the course of release and fan-type ultra-high marker transmitters now being installed by the Bureau of Air Commerce. It also provides indication for the proposed tower and outer markers for use with instrument landing systems. Individual indication of any two or all three of these services, as required, is provided by filters in the receiver which operate responses external lights. Stabilized by quartz crystal oscillator—and is complete with a self-contained, quickly detachable power supply.

For full details, write to Western Electric Company, Department 320-A, 185 Broadway, New York, N. Y.

These leading air lines have standardized on the 27A:

American Airlines	Reichard Airlines
Boeing Airways	Norfolk Airlines
Chicago and Northern Air Lines	Pennsylvania General Airlines
Continental Air Lines	Transcontinental and Western Air
Delta Air Lines	United Air Lines
Eastern Air Lines	Western Air Express



27A RECEIVER

Based on U. S. Commerce Approval No. 241

Crystal controlled "Superhet"  
Operates on fixed frequency of  
75 megacycles.  
Weight 19.5 lbs. complete.  
Measures approximately 14 1/2" x 16"  
high, 9 1/2" x 10" wide, 18 x 12" deep.

## Western Electric

Western Electric  
in Canada

TWO-WAY AVIATION RADIO TELEPHONE AND TELEGRAPH EQUIPMENT

### 3 Spots and a Horn

(Continued from page 70)

the Mod loading system, two of the major objectives of the Bureau of Standards system are achieved. In the first place, the glide path is a straight line, and in the second place it is independent of changes in the reflecting properties of the ground surface.

In the proposed system four beams will establish two overlapping regions, one for vertical and one for horizontal direction. The two overlapping regions will intersect along a line corresponding to the landing path. All four beams will be sent on the same frequency, but each modulated with a different audio frequency. The audio frequencies are separated by filters in the receiver, individually identified and applied to an indicator which shows whether the plane is above or below, or left or right of, the landing path. In preliminary tests, directivity will be established only in the vertical plane, a runway leader being used for left or right indication. The horns for the former purpose will be set up at the side of the runway leading.

The theory of the horn radiator has been carefully studied by Dr. Barrow and his assistants with a transmitter generating about 3 watts at a wavelength of 30 cm. (a frequency of 600 megacycles). This radiator emits a "W" shaped beam. The 27A tube, a triode built especially for ultra-high frequency generation. The transmitter frequency is stabilized by the use of quartz-wave transistors, low antennas, and the output is applied to a quarter-wave diode system situated in the throat of the horn structure, which is constructed of polished iron sheets. The apparatus was set up in a large antenna field in the grounds of the Weirfield. A portable field-strength measuring set, consisting of a 555 tube grid-leak detector and amplifier was used to register the field strength, through the horizontal spread plane in front of the horn. The experimental results agree very closely with the theoretical predictions, and show clearly that the pattern scanned by the waves depends on the horn structure alone and may be made independent of ground effects. Further studies are now in progress to show the directivity in the vertical plane and to

check the stability of the overlapping regions between two horns.

In addition to this testing program, work is in progress to develop a transmitter and receiver for wavelengths shorter than 100 cm. One receiver design showing great promise is a crystal-controlled superheterodyne in which the carrier frequency is derived from a 34 Mc. quartz crystal, whose output frequency is multiplied by decoder and tripler circuits to a frequency of about 340 Mc. This frequency is then mixed with the incoming signal frequency and the difference frequency (about 4.5 Mc.) is amplified by conventional methods.

An overall voltage gain obtained at about 50,000 times is obtained from vacuum to vacuum detector output with ample stability. The band-width accepted in the microphone frequency amplifiers, 300 kc., is sufficiently wide to allow for the observed frequency variations in the superheterodyne.

Further work on transmitters involves the production of somewhat higher power than that available from the horn transmitter, but the power problem is not serious because of the power gain obtained through the use of the directional reflecting surface and because high antenna efficiency can be obtained and used. Sufficient work has been done with the transmitter and receiver to indicate that the "W" shaped beam reference landing path can be produced, that its position and direction can be maintained independent of changes in the ground surface and that by the use of center frequency beams modulated with distinct audio frequencies, it is possible to establish all-course signals in the vertical as well as horizontal directions.

It is planned to use marker beacons, whose intersections with the landing path will establish alternate course signals. Further, the glide angle of the landing path may be changed by adjusting the horns, to accommodate the requirements of different classes of aircraft.

### The Cathode-Ray Indicator

The remaining, and highly important, problem is the one of indicating the glide path and its relation to the plane, on the instrument panel of the ship. Here Menlo's original idea of

drawn transmitters has been extended and simplified. Through the original suggestion of Dr. W. H. Hall of the Electrical Engineering Department, orientation from gyro instruments in the ship is combined with the landing path indicator, with the result that only one instrument is needed. This transmitter establishes the landing path, and serves as one of the three points. The other two points are obtained from the gyro instruments already in the airplane, the artificial horizon and the gyro compass. The indication of these instruments, that is, the tilt and direction of the plane, can very readily be used in Mod loading to establish a reference line along which the horizon and its extension through which the low passes. The difficulty is that the indications come from separate instruments and are not coordinated with the glide path indicator.

To avoid these difficulties the indications of the artificial horizon and the gyro compass are transferred electrically, in the form of a cathode-ray tube when they appear together with the indication of the glide path receiver. On the face of this cathode-ray tube appear three sets of light one representing the glide path trace, another and its position with reference to the center of the plane, the other two representing points, on a line parallel to the horizon, which are contained in the reference plane. The pilot observes these three points, and by visual reference to the instrument is passing through them, he is enabled to make a landing entirely independent of the direct visibility of the airport surface. It is possible that the reference points are kept on a horizontal line, the center point equidistant from the other two, as the plane nears the ground the other points move slowly away from the center.

The cathode-ray tube is sufficiently new to require practice that many of Avionics' readers may be anxious to learn with the principles of operation. As chosen to the diagram the tube is an evacuated glass structure, known as the glow of a lamp, with a closed base. The inside surface of this base is coated with a thin fluorescent layer of zinc antimonate. A stream of electrons, produced by the thermionic effect of the tube, is directed toward the coating, where it produces a spot of light. The direction of the electron stream may be altered in a horizontal as well as vertical direction by applying direct or alternating voltages to two sets of "deflecting plates" within the tube. Thus the narrow direction after the position of the spot

of light produced on the fluorescent screen, movement is vertically or horizontally as desired. In addition, the spot may be moved altogether by interrupting the electron stream with a control voltage applied to the control grid of the tube. The action of defocusing and intercepting the spot of light is accomplished almost instantaneously, and as a consequence, it is possible to increase and deflect the beam at an extremely rapid rate. Although the tube itself can produce but one spot of light at a time, it is possible to produce the illusion of three spots by utilizing the persistence of vision of the eye which gives the illusion of three spots of light from five successive positions of a single spot. The voltages which cause and define the spot in the proper sense are not applied in the tube through a motor-driven cam-operated switch; the rotation rate of the cam is long about 80 revolutions per second. Part of the important contribution of the M.I.T. staff to the problem has been the development of a satisfactory switch which will operate continuously without failure.

The cam-operated switch is arranged that when the center spot of the three-spot system is produced, voltages are applied to the defocusing plates which move the spot left or right or up or down according to the signals received by the glide path radio receiver. This is accomplished by controlling the line and horizontal modulation frequencies and applying them through the proper coupling circuits in the vertical and horizontal defocusing plates of the tube. Consequently the center spot is caused to move so that its position indicates the position of the plane relative to the glide path. If the spot is to the left of the center of the fluorescent screen, the plane is to the right of the glide path; if it is below the center, the plane is above the path, and so on.

#### Spots from Gyro Instruments

The remaining two spots on the screen are controlled by electrical indications from the Sperry artificial horizon and Sperry gyro compass. The voltages employed for defocusing in these cases are obtained by voltage dividers connected directly within the case of the gyro instruments. The minimum voltages of the gyro compass are wound on curved cambs rotated consecutively about the center of rotation of the gyro system. Patterned in the gyro element itself are two extremely light and fine "quadrants" of tungsten wire which bear light

upon the resistor wire on the stationary cambs. The deflection of these wires against the stationary wires in one direction is to produce a negligible effect (as indicated by very control beam) on the screen of the gyro, but at the same time sufficient to give a positive electrical contact with the resistor wire. As the gyro element rotates with respect to the frame, the voltages between one end of the resistor wire and the metal-shield contact it made to vary in direct proportion with the angular deflection.

In the case of the gyro compass a direct voltage is applied to the terminals of the resistor winding, and the portion of the voltage across the cambs which is applied to the tungsten defocusing plates of the cathode ray tube. As the compass deviates to the left or right of the reference position, the defocusing voltages cause the two outer spots of light to move bodily to the left or right. In this way, the compass indication is transferred to the face of the tube so that it may be used simultaneously with the heading path indication.

At the same time potentials are obtained by a similar voltage divider from the artificial horizon gyro. In this case the voltage is of an alternating character and it is applied to the vertical defocusing plates that the two outer spots are moved up and down according to the tilt of the gyro disc with respect to an air frame. In consequence, the line connecting the two outer spots lifts away from the horizontal in direct proportion to the gyro element's deviation from the wing line of the ship.

#### Advantages of Cathode-ray

The extremely important indication of instruments has several advantages. It combines compass and horizon indications on one indicating instrument, an arrangement to be desired under any condition of light. Secondly, it coordinates these indications with that of the glide-path indicator, again on the face of the same instrument. The pilot is thus enabled to make an instrument landing on the most convenient he has been watching. The gyro and horizon pictures throughout the flight in the airport. The fact that the indications are transferred electrically over wires which may be of the gyro compass length, permits the mounting of the gyro compass and the artificial horizon wherever convenient on the ship, and not always in the instrument panel as has been heretofore customary. It is possible to give compass

and horizon indications in several positions on the ship, if desired. The cathode-ray tube itself has been developed from its early status as a laboratory instrument to a rugged piece of flying equipment capable of withstanding the abuse to which any of the conventional airplane instruments can be subjected without damage.

The M.I.T. staff working on the project has developed a variation of the three-spot indication which shows promise. A bar of light, representing the horizon, is produced on the cathode-ray tube by applying an alternating voltage to give horizontal defocusing plates. This line is shifted bodily left or right by the control voltage derived from the voltage divider associated with the gyro compass. The angular tilt of the line is similarly derived by the action of the voltage divider associated with the artificial horizon. In addition, a small circle of light, produced by a modulation of horizontal voltage, is caused to move left or right, up or down, according to the glide path indicator associated with the radio receiver. By keeping the circle centered on the center of the bar, and by maintaining the bar centered and level, the proper attitude of the ship for landing is maintained.

It may be thought that the equipment required for producing the various potentials and for sending them at the proper intervals is very heavy and cumbersome. This is far from the case. While the equipment has been designed primarily for use in transport ships, which allow sufficient room for the installation, it is adaptable to smaller ships. A supply of 100-volt 60-cycle alternating current is required for operating the instrument in its present form, but this can be obtained if not available from the regular ship supply, by employing a vibrator or dynamo supply. The experimental equipment has been repaired from a dynamo to simulate aircraft conditions.

As has already been stated, the system is still in the experimental stage, and much work remains to be done before flight tests can be undertaken. The project thus far made a worthy of praise not only for the navy actively developing it, but for the Bureau of Air Commerce for its active moral and financial support at a project initiated by one of its own engineers.

*Editor's Note: AIRCRAFT will keep its readers advised of progress as new information is made available.*



BUY ACCO QUALITY

A NEW OF THE 137  
AMERICAN CHAIN & CABLE  
INDUSTRIAL PRODUCTS



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71

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chaos brought upon her. Since then the Maroon-Bronze racer, flown by Orman, has been further advanced by mounting a second set of cowlers, by improving the landing gear with a wheel suspension directly off of the bottom engine cowling, and in a number of other ways. The crew that has worked with this plane is confident that it is capable of over-coming 300 m.p.h. to 350 m.p.h. in a race.

Right as when the Thompson beat this year, or about as in 1937, should be J. J. Williams in Illinois. Williams has spent many winter days completely retooling the cooling system on this plane, which carries a Cessna D-32 liquid cooled engine. A win for Williams would not be an upset, as he has had some bad luck in the past and then may be his turn to strike pay dirt. General business of the Williams race are well known. Chet Jackson is in the driver's appearance which makes people think when they see it out at front of Pioneer strip, like the man who was a guide for the first time and study showed that "There ain't no such animal." In Williams' case we can't laugh off the truly amazing speeds he has put up with what looks like a pile of junk. Among other things known to be learned from Williams are the importance of making the good seats ahead of good looks, and also the proof that level landing gear can be just as close as invisible zero, everything considered. Williams never as much single with his simplified spring, but says that he is able to make up to 100 lb. weight of the plane while still be in the lead position of the wheel.

As in the past, Boone Turner will have his Maroon-Bronze-Laid racer right up among the leaders. This year his previous losses described but we'll repeat that it is a mid-wing cantilever monoplane with fixed landing gear. Powered with a Twin Wasp engine the plane is rather large and heavy and has not lived up to what was hoped to be its swiftness story. Originally built for Turner by Lawrence W. Brown, the plane was later completely rebuilt by Elmer Laid.

Final favor among the new racers is the Cessna-Compass powered by the Sweeney built by the Pioneer Williams Airplane Co. of Venice, Calif., and to be flown by Lee Williams. This plane is sponsored by Mrs. Edith Reynolds Clark, herself a pilot although a woman many years old, who sponsored the Rader race which is now run in the Maroon-Bronze

loop. Pioneer and Williams have brought together a galaxy of experienced, speed plane racers and the results should prove interesting, if not stirring. The Pioneer-Williams entry may well lead the whole parade by a wide margin. At this date the plane has yet to be test flown, but it is substantially complete and should be at Cleveland. Design work on the Sweeney was shared by C. A. Pearson and Sidney Wilson, both of whom have worked with Keith Baker on various race planes. The ship is of distinctive type, however, being a high mid-wing cantilever monoplane, with landing gear that installs into the landing mark like the Rader's struts. The wing is all wood, while the fuselage is of steel tube construction with a smooth plywood shell covering. Cooling of the engine has been very carefully handled. Cooling air for the piston radiator is brought in through a hollow propeller spinner and distributed over a radiator radiator much as in William's Reno. Carburetor air is taken

from a smoothly built scoop at the top of the engine cowl and fed to the carburetor as ideas by a similar scoop at the bottom of the cowl. Wing span of the plane is 24 ft., length 46 ft., and wing area 92 sq. ft., gross weight is 1,850 lbs. Lee Williams is considered to be racing as a pilot, but has been associated with Marion McKee as mechanic for a number of years. He believes this plane is potentially the fastest plane to appear at Cleveland this year. But we must on the biplane tradition that usually bears new designs to keep it from taking any form in its first time out. We may be fooled, but Williams will have to be somewhere near 300 m.p.h. for the Thompson Trophy chance to win.

Spice has not permitted a detailed description of the new plane to be seen at Cleveland as we should like to repeat our plan to ask some of the designers that they get around these racers as closely as possible in order to observe at first hand the really considerable design work that has been done in most races.

## Aircraft Armament

(Continued from page 31)

away aircraft would be a distinct advantage in the plane having the longest range gun and best aiming facilities. In this position, instead, the conventional plane would have a high concentration of fire having at least 4 guns trained on the target. Selfishness cannot be placed upon making such gun independence and flexibility, with a large field of fire and range together with good vision for the gunner. Over-lapping angles of fire for all guns, to some good advantage will easily follow.

Objection has been raised to lateral fire and its difficulties, since the factors are affected by ship motions and windblast caused by forward velocity. However, the possibilities of direct asternship have been demonstrated. The position described above, has a slight benefit since it reduces the errors due to cross fire. The front gun positions are becoming more appreciated as good defense and offensive posts. (C) shows a gun mounted in such a position. In this installation, the gun is mounted on a rotating ring interconnected with the gunner's seat, the entire mechanism being rotated by manual or mechanical means. It is then that

is an installation of this type the arm has a large cone of fire and it is very flexible, at the same time retaining the stress on the gunner.

Mr. Zupanc has pointed out (Aerobion, April 1936) that the modern high speed planes give the gunner little time to sight his gun and that speed of military responses are almost faster than the speed of transmission of light sensation from the optic nerve to the brain of the gunner. While the distance between planes (100 ft.) assumed by Zupanc is close for modern planes, the point is obvious should be given serious thought as to the gunner.

A necessary arrangement to a good gun installation is a good field of view for the gunner. He must be provided with a field of view that is comparable with or greater than his field of fire and which will enable him to keep up a constant watch of the ship that center which is assigned to him. It is essential that large areas of relative space be provided at each gun position. A gunner cannot be expected to aim his gun correctly if there suddenly appears in his range of vision an airplane

(Turn to page 42)

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(Continued from page 30)

whose angular velocity may approach 100 to 125 deg. per sec. All he might be able to do is say, "There goes one!" With sufficient time, however, he has a better chance of spotting the airplane and he will have the target in his sights a longer period of time. Even if he only gets a one shot, it would have a greater chance of being effective, especially if it is a machine shot. The advantage of guns of high muzzle velocity can readily be illustrated from the following example:

If we assume a combat plane diving at 300 m.p.h. upon a bomber proceeding at 250 m.p.h. (Fig. 2), the target velocity at which the combat plane will cross a line 500 feet away from the bomber's path is—

$$W = \frac{125 \times 1.4142 \times 62.2}{300} = 31.2^\circ/\text{sec.}$$

or  
angular velocity =  $\frac{W}{r}$ ,  $V =$   
resultant velocity = 126 m.p.h.,  $r =$   
distance between planes.

We see that the greater the distance between planes the less the angular velocity. Translate this airplane that can open fire at long range has the advantage.

There still remains among the major problems of automatic gun guns, the need for a suitable recoil mechanism for the light machine guns, particularly the 50 cal. type. Such mechanism must be incorporated to relieve the physical stress and allow the gunner more accuracy in sighting. He cannot sight effectively if his gun is reacting so violently that the sights are constantly vibrating. For this purpose, an absorption, shock absorber incorporated in the gun mount should serve to take up recoil shocks. In the larger guns, the recoil mechanism is designed into the gun and shocks are much less. Another point in favor of the large gun. A second problem and one which has many difficulties is that dealing with sights. Fighting airplanes has lagged considerably behind airplane and armament design. Doubtful accuracy can be had with present types of sight vanes sight when used on the high speed plane, the gunner relying on error beliefs to determine his corrections. Sights must be designed to allow the gunner to make his necessary ballistic and aerodynamic corrections for speeds of planes, deflection air currents, distance between planes, etc. without taking more than a fraction of a second. The sights should be fixed relative to the gun, although independent of their mount to match the same rate as the rapidity of motion of anti-aircraft gun.

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